AD-A251 072

(2)

US Army Corps of Engineers

Toxic and Hazardous Materials Agency

SIERRA ARMY DEPOT PHASE I REMEDIAL INVESTIGATION/ FEASIBILITY STUDY

LASSEN COUNTY, CALIFORNIA

FINAL REMEDIAL INVESTIGATION

DAAA15-88-D-0006

TASK ORDER 3

APENDICES G-Q

OCTOBER 1991

JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.

AND

E.C. JORDAN

THAMA Form 45, 1 Jul 90

Appendix G

Geotechnical Sampling Analysis

JMM James M. Montgomery
Consulting Engineers Inc.

APPENDIX G
GEOTECHNICAL SAMPLE ANALYSIS

G.1 - Techniques

Geotechnical sample analysis for SIAD Phase I RI/FS was conducted by NST Engineering of Susanville, California. Analyses performed were sieve analysis and Atterberg limit test (ASTM #C117, C136, and D4318). These tests were performed on selected boring samples. At least one sample from each boring was analyzed. Samples from monitoring well borings were from the screened interval of the well whenever possible. The results of these tests can be found in Appendix G.2.

Sieve analysis is a process of determining particle-size distribution in a soil, sediment, or rock by measuring the percentage of the particles that will pass through standard seives of various sizes. The Atterberg limits are liquid limit and plastic limit. The liquid limit is the water content boundary between the semi-liquid and plastic states of a sediment e.g., a soil. The plastic limit is the water content boundary of a sediment between the plastic and semi-solid states. These are expressed as a percentage water content. The plastic limit and liquid limit define the plasticity index of a sediment. The plasticity index is the water content range of a sediment or soil at which it is plastic. Plasticity index is defined numerically as the liquid limit minus the plastic limit.

G.2 - Results

The data from geotechnical analysis was used primarily to determine grain-size distribution and USCS soil classification, but may also be used to estimate the permeability or hydraulic conductivity of a sample. Using the results of geotechnical analysis alone it is possible to arrive at an estimate for K (hydraulic conductivity) ranging from 10^{-3} to 10^{-1} gpd/ft^2 for finer grained materials at SIAD to 10^{-1} to 10 gpd/ft^2 for coarser grained sediments. The aquifer pumping tests produced similar results. All of the values of hydraulic conductivity for these tests fell into the range of silty sand which has values of K ranging from 10^{-2} to 10^2 gpd/ft^2.

Estimates of Hydraulic conductivity based on grain-size distribution and uniformity of grain-size. For screened interval in monitoring wells.

DMO-5-MWA - Interval 100' screened
~54% finer than #200 mesh
USCS classification: CL
Sandy Clay
K $\simeq 10^3$ to 10^1

TNT-15-MWA - Interval 70' screened
medium and fine sand
$C_u = 2.5$
USCS classification: SP
K $\simeq 10^2$ to 1.0 gpd/ft^2

TNT-16-MWA - Interval 65.9' to 71'
$C_u = 3.8$
medium and fine sand with silt
USCS classification: SP - SM
K $\simeq 10^2$ to 1.0 gpd/ft^2

DSB-6-SB - Interval 126' to 131'
~15% finer than #200
silty sand
USCS classification: SM
K $\simeq 10^2$ - 1.0 gpd/ft^2

ALF-1-MWA - Interval 105' screened
38.4% of material finer than #200 mesh sieve
62.7% of material finer than #100 mesh
fine sand, u fine sand, silt and clay?
K $\simeq 10^{-3}$ to 1.0^{-1} gpd/ft^2/USCS-SM

ALF-2-MWA - Interval 100' screened
uniformity coefficient ~ 3.4
effective size ~ .34 mm
50% size ~ .90 mm
USCS classification SP
K $\simeq 10^{-1}$ to 10 gpd/ft^2

ALF-3-MWA - Interval 100' screened

~ 20% of material finer than #200 mesh
~ 32% of material finer than #100 mesh (.15 mm)
~ 52% of material finer than #50 mesh (.30 mm)
very coarse, coarse, medium, fine, v. fine sand with silt
USCS classification: SM
K $\simeq$ 10^{-2} to 1.0 gpd/ft^2

CCB-1-MWA - Interval 91' screened

27% finer than #200
90% finer than #10
clayey sand
USCS classification: SC
K $\simeq$ 10^{-2} to 1.0 gpd/ft^2

CCB-2-MWA - Interval 100' screened

~32% finer than #200 (silt)
silty sand with majority of sand fine-medium
USCS classification: SM
K $\simeq$ 10^{-3} to 1.0^{-1} gpd/ft^2

DMO-3-MWA - Interval 100' screened

~43% finer than #200 (clay)
sand clay
USCS classification: SC
K $\simeq$ 10^{-3} to 1.0^{-1} gpd/ft^2

DMO-4-MWA - Interval 100'

~35% finer than #200 (clay)
clayey sand
USCS classification: SC
K $\simeq$ 10^{-2} to 10

NST Engineering Associates, Inc

Planning · Surveying · Engineering

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/1/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: ALF / MWA

SAMPLE NUMBER: 15'

DESCRIPTION OF SAMPLE: SP

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 409.1

WEIGHT AFTER PREWASHING (gm.): 403.0

WASHING LOSS (gm.): 6.1

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	—	100
4	0	409.1	100
10	2.5	406.6	99.4
30	68.4	338.2	82.7
50	175.5	162.7	39.8
100	118.2	44.5	10.9
NUMBER 200	36.5	8.0	2.0

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 2.3

B. WASHING LOSS (gm.): 6.1

TOTAL PASSING NO. 200 (gm.) (A + B): 8.4

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 409.5

ERROR (Original weight - total weight of fractions)(gm.): .4

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .10

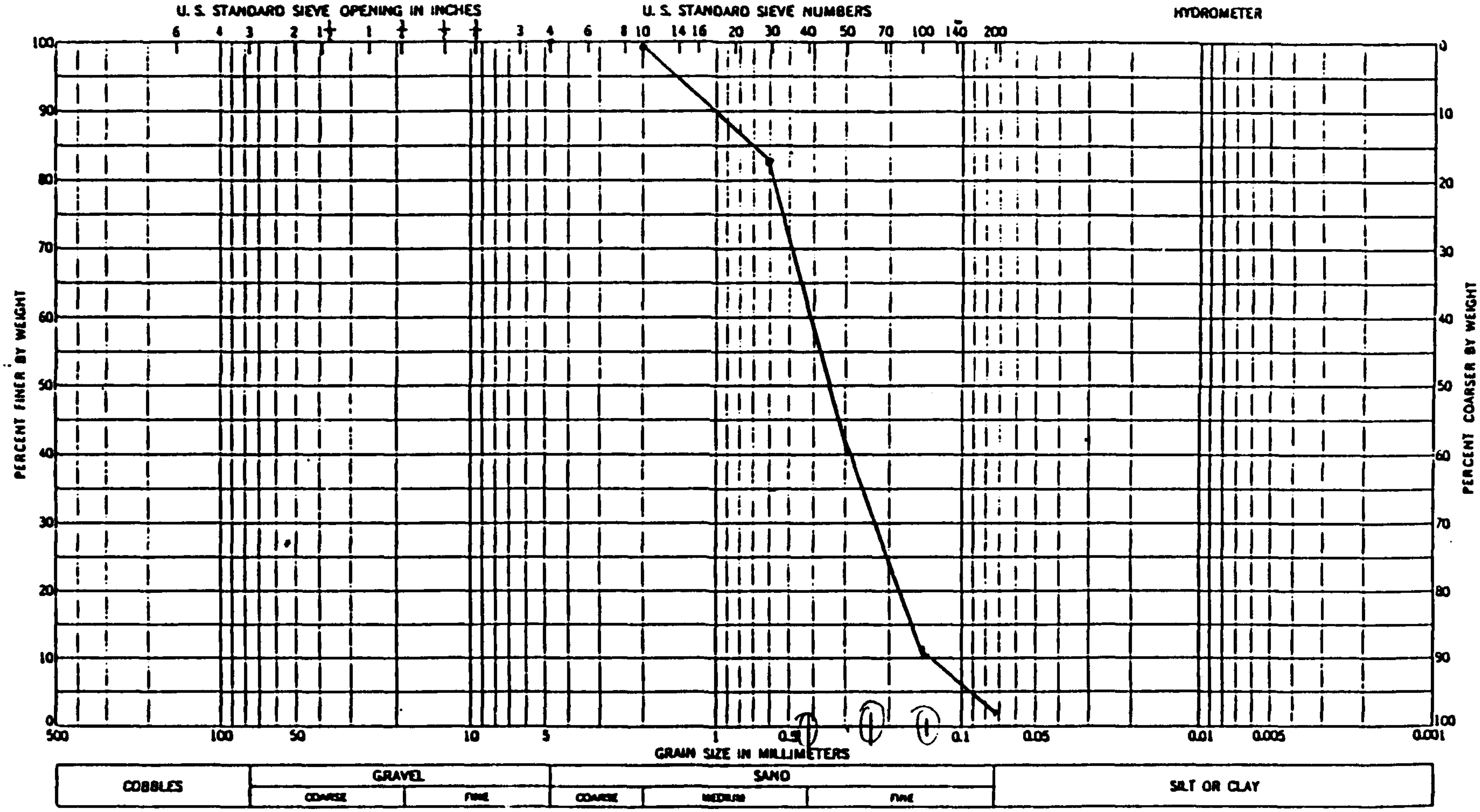
REMARKS:

SAMPLE IS NON - PLASTIC

TECHNICIAN (Signature): Stephen H Schmidt

BY (Signature): S. H Schmidt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. ALF 1 MWA 15'

Date 2/15/90

GRADATION CURVES

ENG FORM 2087

D_{10} = .15

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE		5/1/90
PROJECT REMEDIAL INVESTIGATION S.I.A.D. PHASE I	**EXCAVATION NUMBER** ALF / MWA	**SAMPLE NUMBER** 1 105
DESCRIPTION OF SAMPLE SM		**PREWASHED** ☒ YES ☐ NO
WEIGHT ORIGINAL SAMPLE (gm.) 131.4	**WEIGHT AFTER PREWASHING[1] (gm.)** 89.2	**WASHING LOSS[1] (gm.)** 42.2

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	131.4	100
4	0.3	131.1	99.8
10	1.0	130.1	99.0
30	5.5	124.6	94.8
50	6.4	118.2	90.0
100	35.8	82.4	62.7
NUMBER 200	32.0	50.4	38.4

A. WEIGHT SIEVED THROUGH NO. 200 (gm.) 8.3	ERROR (Original weight - total weight of fractions)(gm.) .1
B. WASHING LOSS[1] (gm.) 42.2	
TOTAL PASSING NO. 200 (gm.) (A. + B.) 50.5	PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$) .07
TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.) 131.5	

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature)	COMPUTED BY (Signature)	Job Number 90-25 A
Stephen H Schmidt	Stephen H Schmidt	

Planning Surveying Engineering

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/1/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: ALF 2 MWA

SAMPLE NUMBER: 35'

DESCRIPTION OF SAMPLE: SP - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 388.0

WEIGHT AFTER PREWASHING (gm.): 361.0

WASHING LOSS (gm.): 27.0

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	388.0	100
4	1.0	387.0	99.7
10	5.8	381.2	98.3
30	42.5	338.7	87.3
50	138.8	199.9	51.5
100	131.4	68.5	17.7
NUMBER 200	36.5	32.0	8.3

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 5.1

B. WASHING LOSS (gm.): 27.0

TOTAL PASSING NO. 200 (gm.) (A + B): 32.1

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 388.1

ERROR (Original weight - total weight of fractions)(gm.): .1

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .03

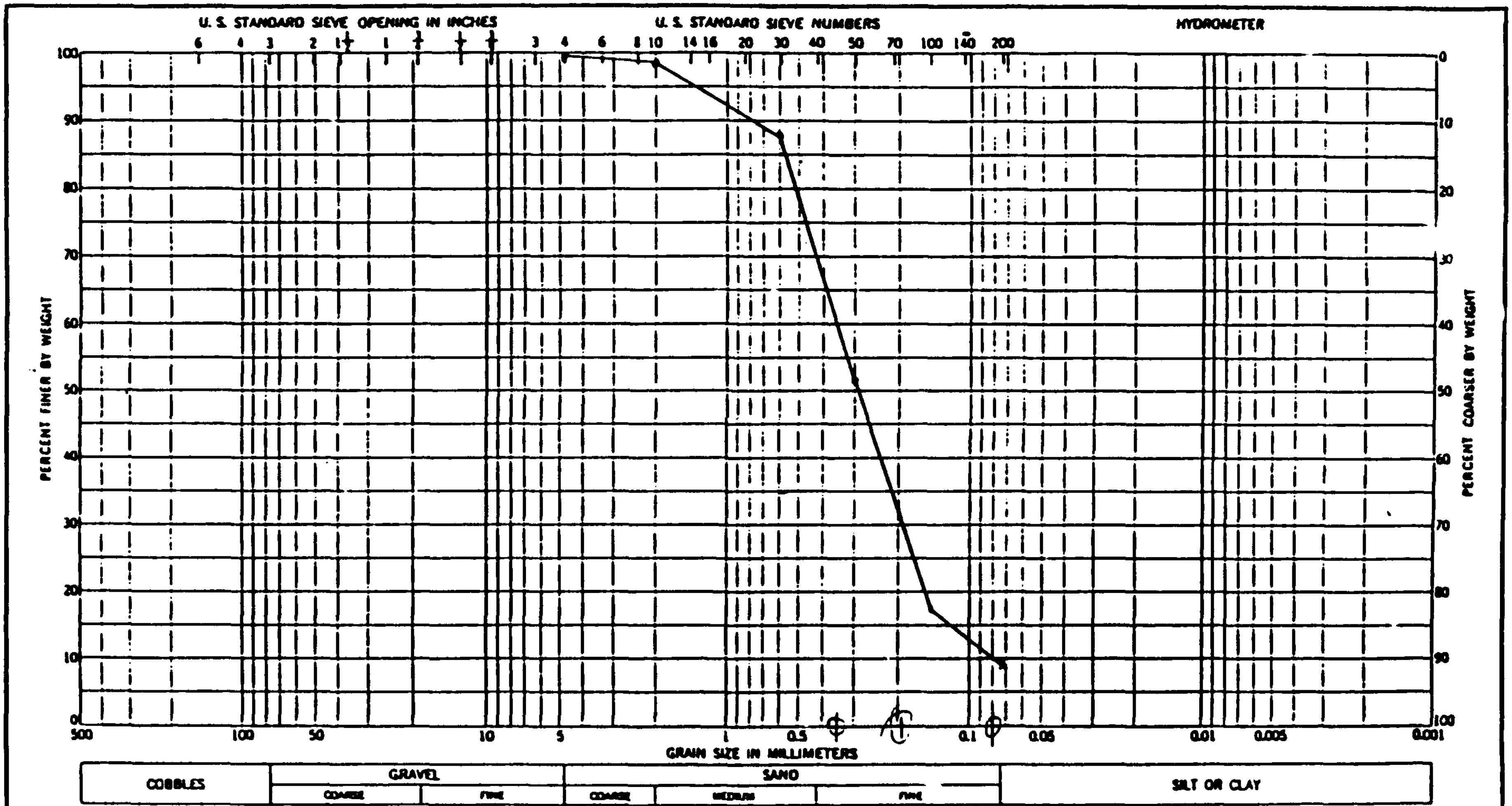
REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. ALF 2 MWA 35'

Date 2/17/90

GRADATION CURVES

ENG FORM 2087 D_{10} = .08

D_{30}

Planning · Surveying · Engineering

NST Engineering Associates, Inc

45 South Hoop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/1/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: ALF 2 MWA

SAMPLE NUMBER: 100'

DESCRIPTION OF SAMPLE: SP

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 418.1

WEIGHT AFTER PREWASHING[1] (gm.): 413.4

WASHING LOSS[1] (gm.): 4.7

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	418.1	100
4	8.2	409.9	98.0
10	47.4	362.5	86.7
30	224.0	138.5	33.1
50	117.4	21.1	5.1
100	13.5	7.6	1.8
NUMBER 200	2.2	5.4	1.3

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 0.2

B. WASHING LOSS[1] (gm.): 4.7

TOTAL PASSING NO. 200 (gm.) (A. + B.): 4.9

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 417.6

ERROR (Original weight - total weight of fractions)(gm.): .5

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .12

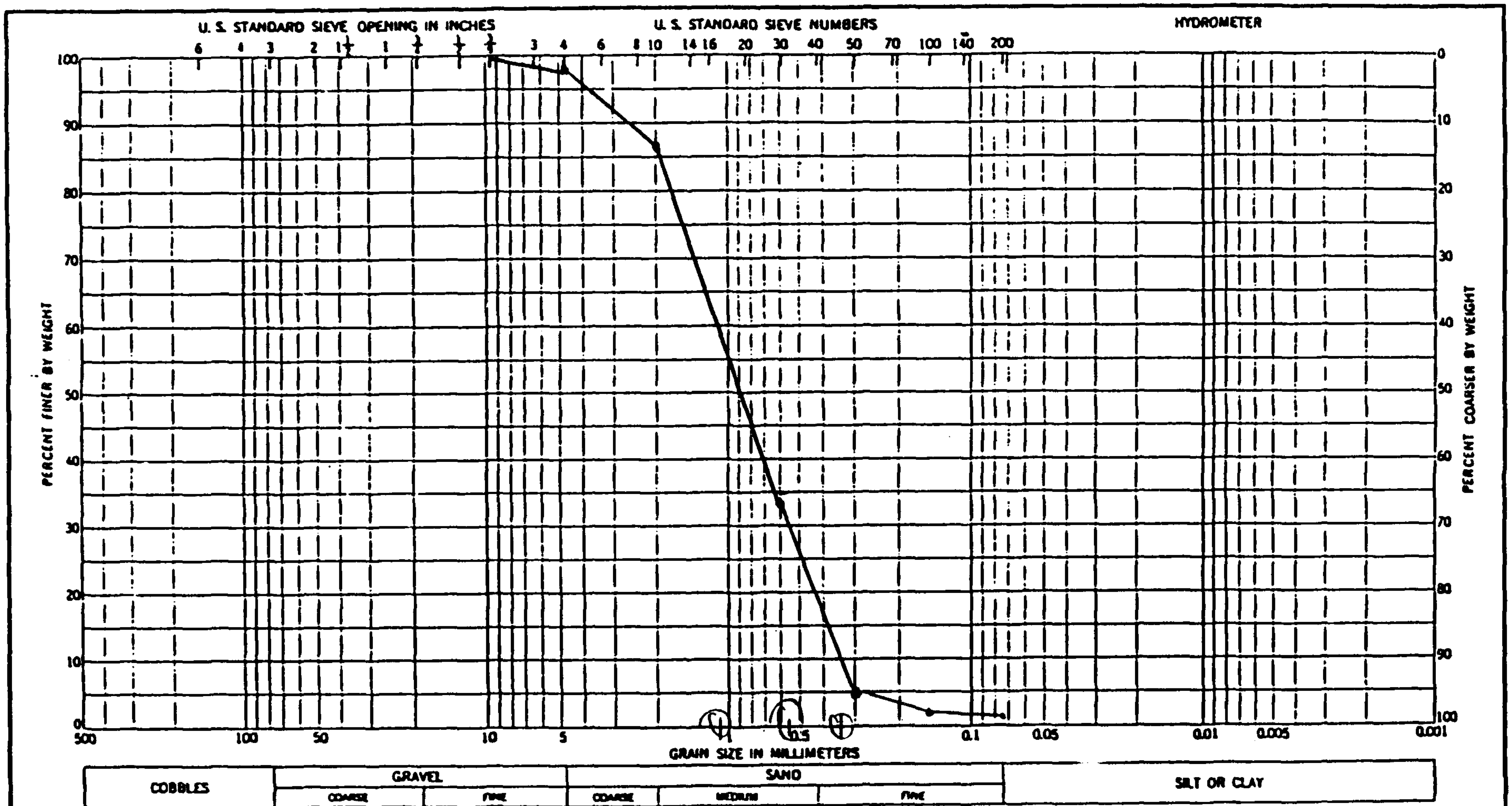
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmitt

COMPUTED BY (Signature): Stephen H. Schmitt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. ALF 2 MWA 100'

Date 2/18/90

GRADATION CURVES

ENG FORM 2087

$D_{10} = .35$

D_3 ... .

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/1/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: ALF 3 MWA

SAMPLE NUMBER: 35'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 228.7

WEIGHT AFTER PREWASHING (gm.): 203.3

WASHING LOSS (gm.): 25.4

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	228.7	100
4	2.0	226.7	99.1
10	12.0	214.7	93.9
30	80.5	134.2	58.7
50	45.8	88.4	38.7
100	22.5	65.9	28.8
NUMBER 200	33.2	32.7	14.3

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 6.8

B. WASHING LOSS (gm.): 25.4

TOTAL PASSING NO. 200 (gm.) (A. + B.): 32.2

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 228.2

ERROR (Original weight - total weight of fractions)(gm.): 0.5

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$ .22

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A

Planning Surveying Engineering

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/1/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: ALF 3 MWA

SAMPLE NUMBER: 100'

DESCRIPTION OF SAMPLE: SM

PREWASHED: [X] YES [ ] NO

WEIGHT ORIGINAL SAMPLE (gm.): 215.2

WEIGHT AFTER PREWASHING (gm.): 176.6

WASHING LOSS (gm.): 38.6

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	215.2	100
4	3.6	211.6	98.3
10	15.7	195.9	91.0
30	42.4	153.5	71.3
50	41.0	112.5	52.3
100	43.3	69.2	32.2
NUMBER 200	26.3	42.9	19.9

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 3.9

B. WASHING LOSS (gm.): 38.6

TOTAL PASSING NO. 200 (gm.) (A. + B.): 42.5

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 214.8

ERROR (Original weight - total weight of fractions)(gm.): 0.4

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .19

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature)	COMPUTED BY (Signature)	Job Number
Stephen H Schmidt	Stephen H Schmidt	90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/1/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: ALF 1 SB

SAMPLE NUMBER: 40'

DESCRIPTION OF SAMPLE: SP - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 319.8

WEIGHT AFTER PREWASHING (gm.): 296.5

WASHING LOSS (gm.): 23.3

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	319.8	100
4	0.5	319.3	99.8
10	5.8	313.5	98.0
30	18.4	295.1	92.3
50	30.4	264.7	82.8
100	182.8	81.9	25.6
NUMBER 200	51.5	30.4	9.5

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 6.3

B. WASHING LOSS (gm.): 23.3

TOTAL PASSING NO. 200 (gm.) (A. + B.): 29.6

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 319.0

ERROR (Original weight - total weight of fractions)(gm.): 0.8

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .25

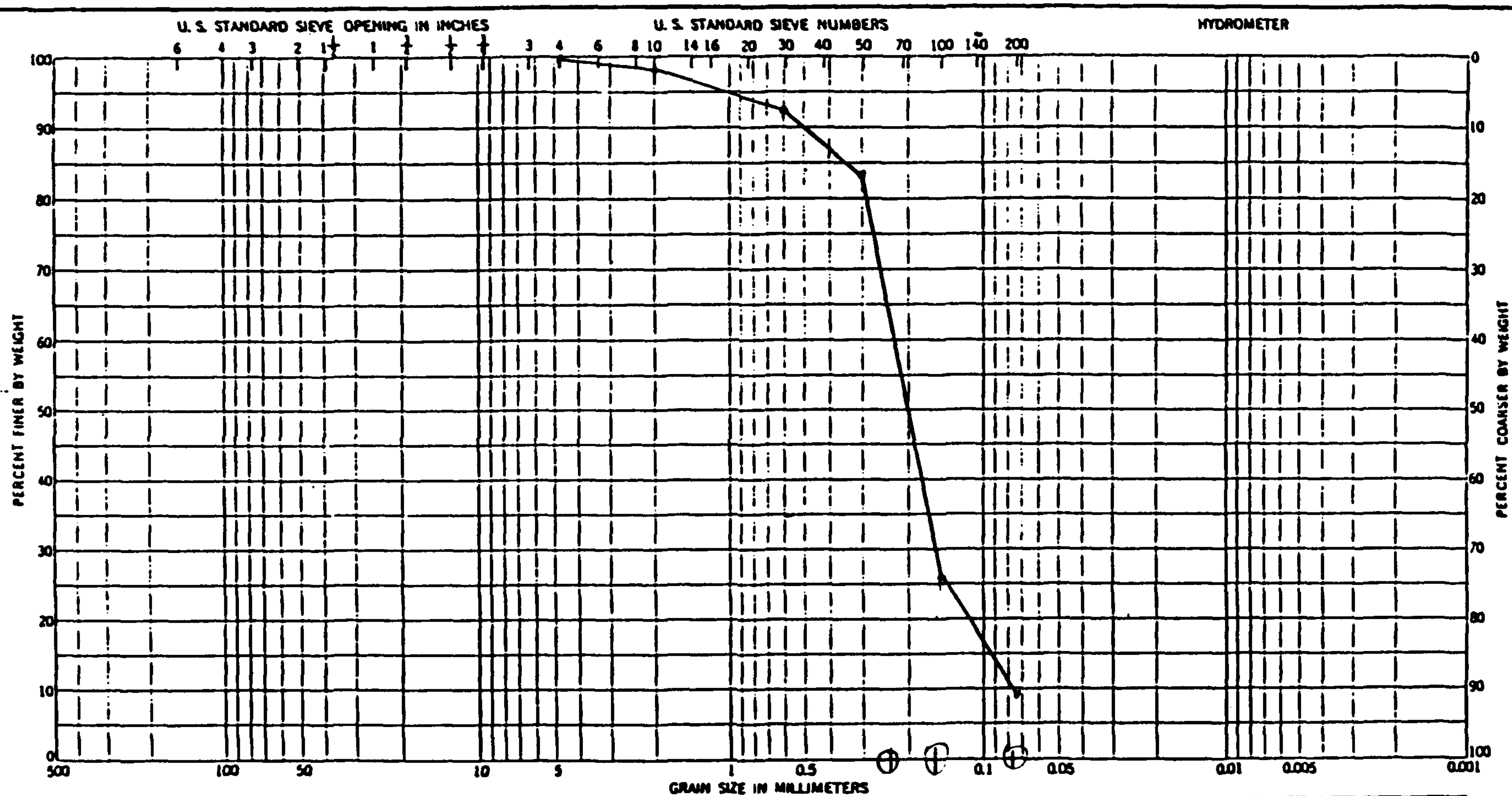
REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmidt

COMPUTED BY (Signature): Stephen H Schmidt

Job Number 90-25 A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. ALF 1 SB 40

Date 3/17/90

GRADATION CURVES

D_{10} .078

[redacted], [redacted] 208[redacted] D[redacted], [redacted] ([redacted] - [redacted] / [redacted]

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/1/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: ALF 15B

SAMPLE NUMBER: 80'

DESCRIPTION OF SAMPLE: SP – SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 728.5

WEIGHT AFTER PREWASHING (gm.): 696.0

WASHING LOSS (gm.): 32.5

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/4	0	728.5	100
1/2	30.1	698.4	95.9
3/8	20.0	678.4	93.1
4	35.1	643.3	88.3
10	101.4	541.9	74.4
30	192.2	349.7	48.0
50	121.5	228.2	31.3
100	132.4	95.8	13.2
NUMBER 200	51.1	44.7	6.1

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 11.8

B. WASHING LOSS (gm.): 32.5

TOTAL PASSING NO. 200 (gm.) (A. + B.): 44.3

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 728.1

ERROR (Original weight - total weight of fractions)(gm.): 0.4

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .05

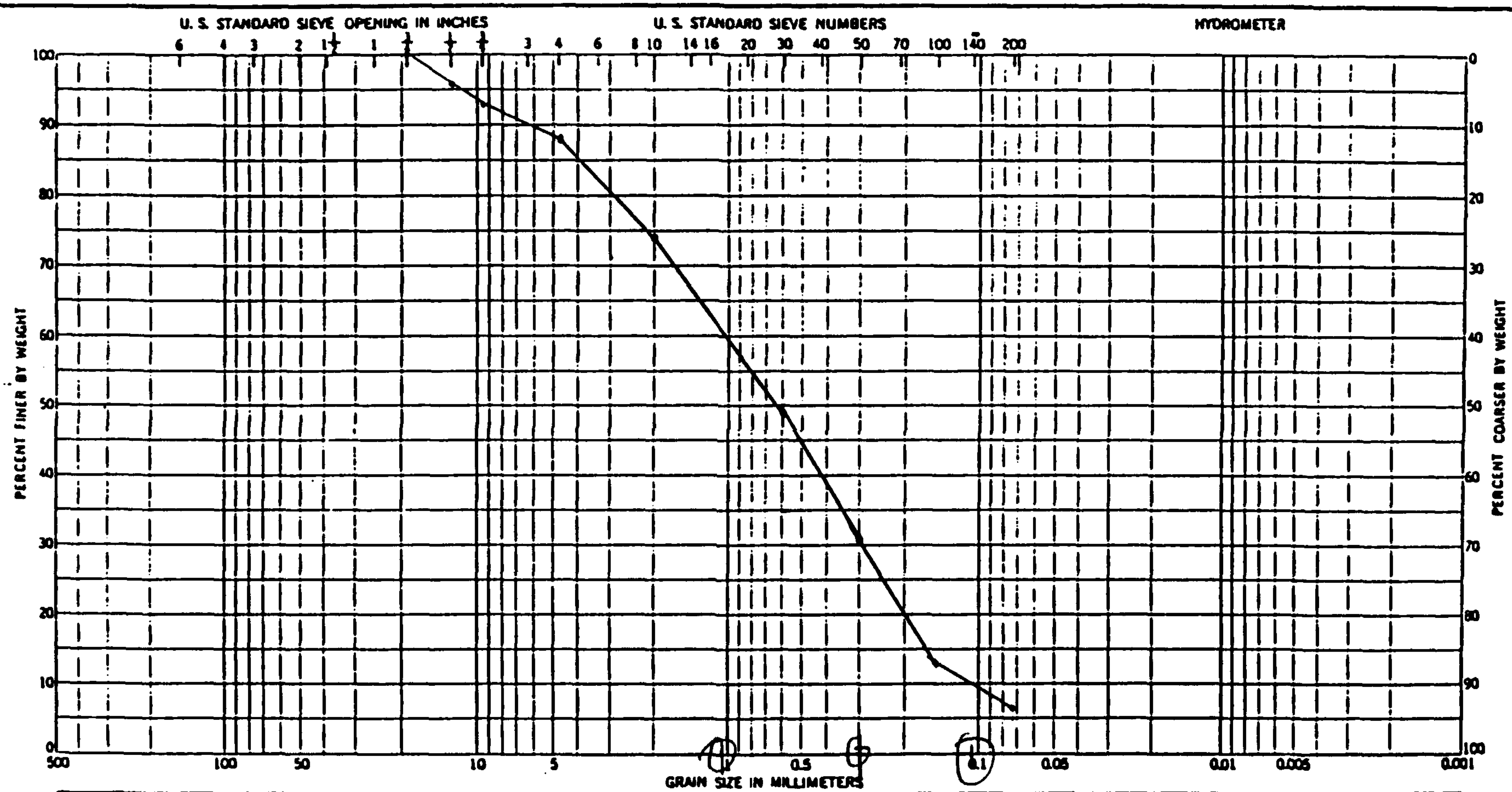
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No.

Date

GRADATION CURVES

[redacted] [redacted]G [redacted], 2[redacted] D_{10} = .11 D.[redacted] = [redacted] [redacted] [redacted] [redacted] ([redacted] [redacted] $\underline{0}$ 9 [redacted] = [redacted] [redacted] [redacted] [redacted] [redacted] [redacted]

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/1/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: ALF 2 SB

SAMPLE NUMBER: 40'

DESCRIPTION OF SAMPLE: SP - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.)	WEIGHT AFTER PREWASHING[1] (gm.)	WASHING LOSS[1] (gm.)
419.1	380.0	39.1

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	419.1	100
4	2.9	416.2	99.3
10	4.9	411.3	98.1
30	32.8	378.5	90.3
50	164.9	213.6	51.0
100	117.0	96.6	23.1
NUMBER 200	51.4	45.2	10.8

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 5.4

B. WASHING LOSS[1] (gm.): 39.1

TOTAL PASSING NO. 200 (gm.) (A. + B.): 44.5

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 418.4

ERROR (Original weight - total weight of fractions)(gm.): 0.7

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .17

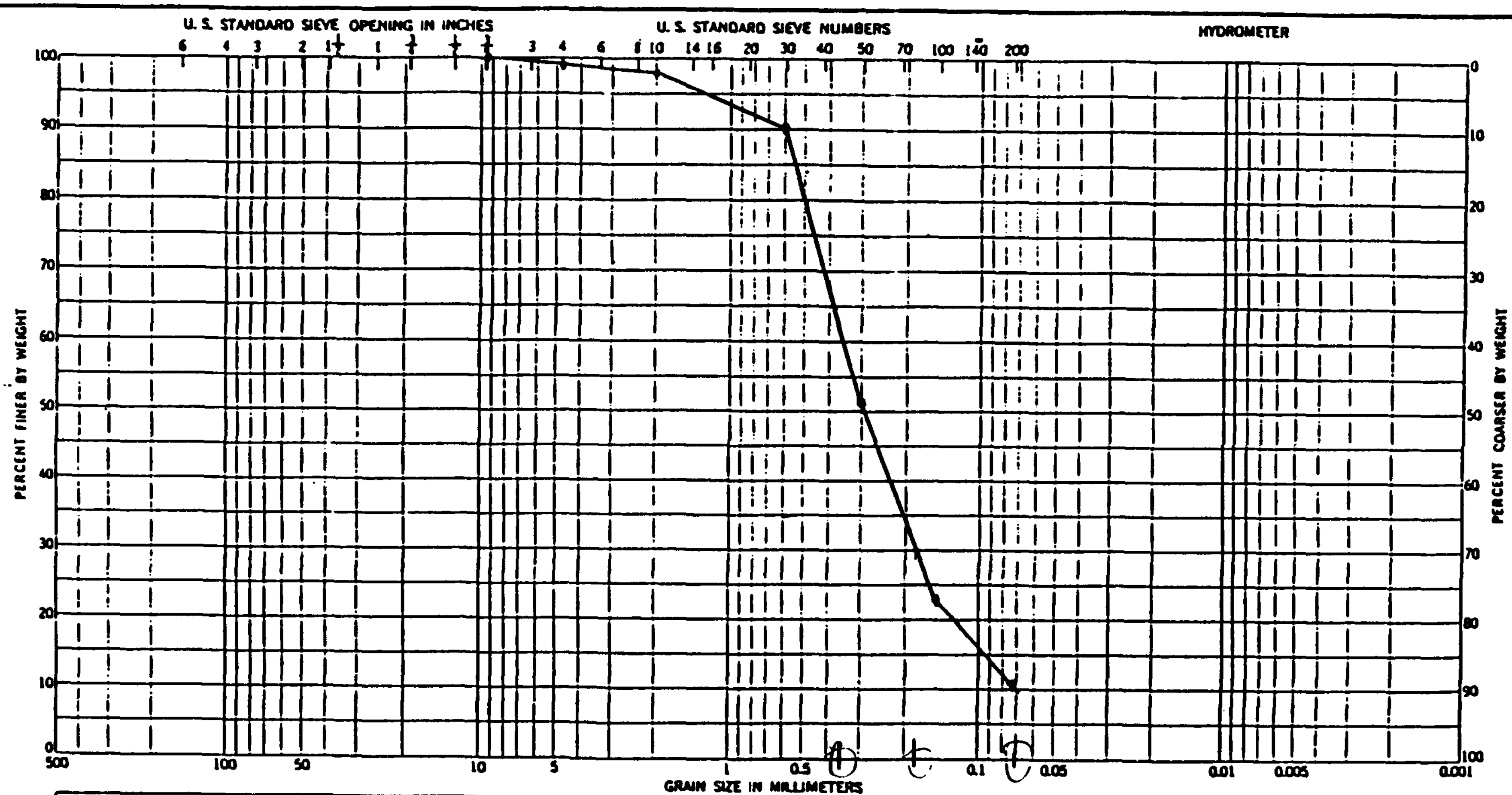
REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. ALF 2 SB 40'

Date 3/18/90

GRADATION CURVES

ENG [redacted] FORM 2087 [redacted] D_{10} = .07 [redacted]

Planning Surveying Engineering

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/1/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: ALF 2 SB

SAMPLE NUMBER: 80'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 535.8

WEIGHT AFTER PREWASHING (gm.): 445.1

WASHING LOSS (gm.): 90.7

SIEVE OR SCREEN (a)	WEIGHT RETAINED ON SIEVE (gm.) (b)	PASSING SIEVE WEIGHT (gm.) (c)	PASSING SIEVE PERCENT (d)
1/2	0	535.8	100
3/8	4.0	531.8	99.3
4	15.7	516.1	96.3
10	105.5	410.6	76.6
30	60.5	350.1	65.3
50	69.0	281.1	52.5
100	116.0	165.1	30.8
NUMBER 200	52.8	112.3	21.0

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 21.5

B. WASHING LOSS (gm.): 90.7

TOTAL PASSING NO. 200 (gm.) (A. + B.): 112.2

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 535.7

ERROR (Original weight - total weight of fractions)(gm.): .1

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .02

REMARKS

L.L. = 24
P.L. = 20
P.I. = 4

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25 A

Planning Surveying Engineering

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/1/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: ALF 3 SB

SAMPLE NUMBER: 40

DESCRIPTION OF SAMPLE: SM

PREWASHED: [X] YES [ ] NO

WEIGHT ORIGINAL SAMPLE (gm.): 577.2

WEIGHT AFTER PREWASHING (gm.): 503.0

WASHING LOSS (gm.): 74.2

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	577.2	100
4	1.2	576.0	99.8
10	24.2	551.8	95.6
30	62.6	489.2	84.8
50	178.7	310.5	53.8
100	150.3	160.2	27.8
NUMBER 200	74.5	85.7	14.9

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 10.3

B. WASHING LOSS (gm.): 74.2

TOTAL PASSING NO. 200 (gm.) (A. + B.): 84.5

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 576.0

ERROR (Original weight - total weight of fractions)(gm.): 1.2

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .21

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA			DATE 5/1/90
PROJECT REMEDIAL INVESTIGATION S.I.A.D. PHASE I		EXCAVATION NUMBER ALF 3 SB	SAMPLE NUMBER 50'
DESCRIPTION OF SAMPLE SM			PREWASHED ☒ YES ☐ NO
WEIGHT ORIGINAL SAMPLE (gm.) 396.2	WEIGHT AFTER PREWASHING (gm.) 328.3		WASHING LOSS (gm.) 67.7

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	396.2	100
4	7.0	389.2	98.2
10	9.9	379.3	95.7
30	99.4	279.9	70.7
50	106.1	173.8	43.9
100	64.4	109.4	27.6
NUMBER 200	35.5	73.9	18.7

A. WEIGHT SIEVED THROUGH NO. 200 (gm.) 5.3	ERROR (Original weight - total weight of fractions)(gm.) .9
B. WASHING LOSS (gm.) 67.7	
TOTAL PASSING NO. 200 (gm.) (A + B.) 73.0	PERCENT ERROR (Error (gm.) / Original weight (gm.) x 100) .23
TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.) 395.3	

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature)	COMPUTED BY (Signature)	Job Number 90-25 A
Stephen H Schmitt	Stephen H Schmitt	

Planning Surveying Engineering

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/7/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: CCB / MWA

SAMPLE NUMBER: 35'

DESCRIPTION OF SAMPLE: SP

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 218.7

WEIGHT AFTER PREWASHING[1] (gm.): 213.1

WASHING LOSS[2] (gm.): 5.6

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	—	100
4	0	218.7	100
10	0.3	218.4	99.9
30	22.0	196.4	89.8
50	99.2	97.2	44.4
100	81.0	16.2	7.4
NUMBER 200	10.5	5.7	2.6

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 0.3

B. WASHING LOSS[2] (gm.): 5.6

TOTAL PASSING NO. 200 (gm.) (A. + B.): 5.9

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 218.9

ERROR (Original weight - total weight of fractions)(gm.): 0.2

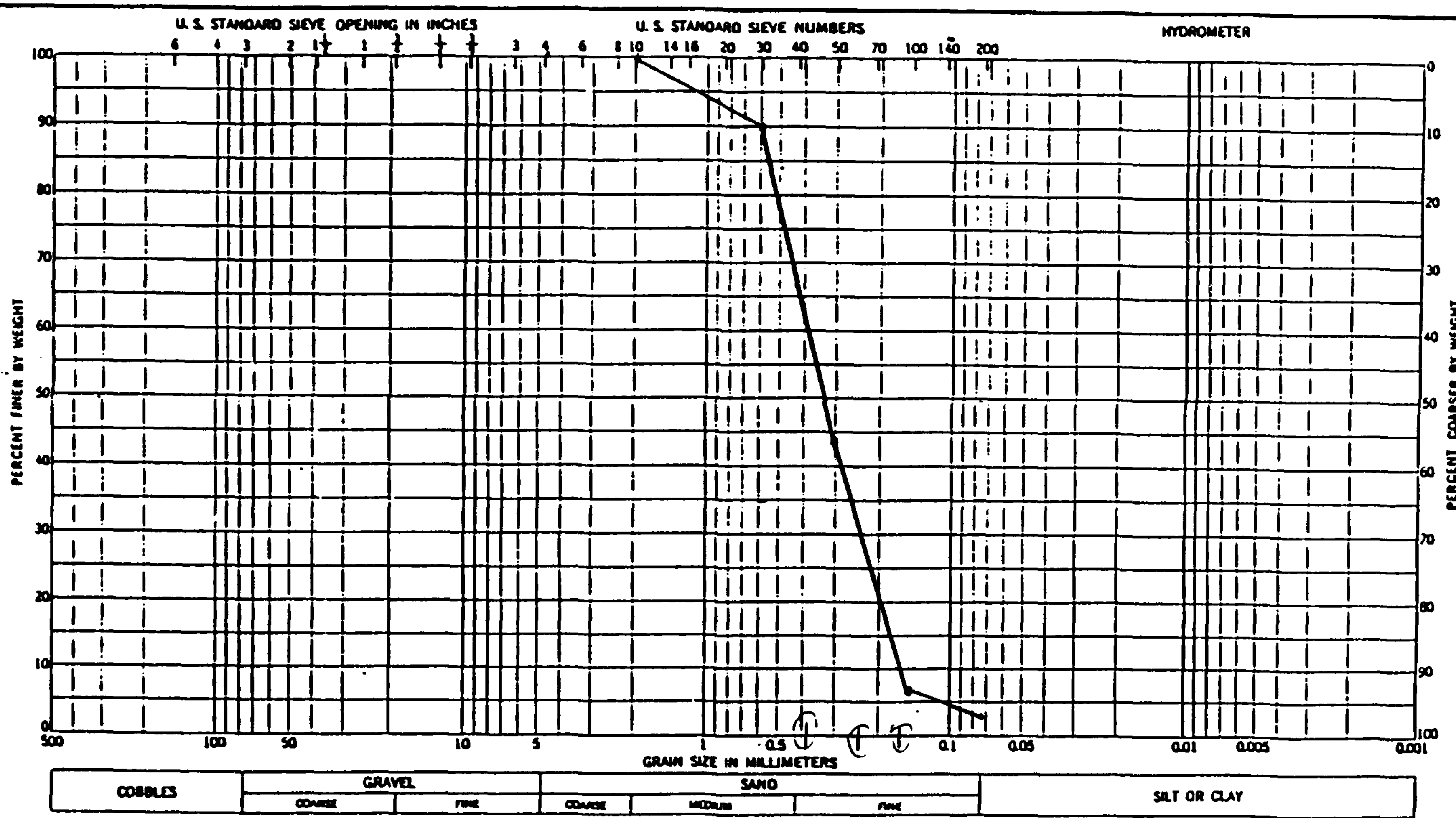
PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .09

REMARKS: SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmitt

COMPUTED BY (Signature): Stephen H. Schmitt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. CCB 1 MWA 35'

Date 2/20/90

GRADATION CURVES

ENG FORM 1 MAY 63 2087 D_{10} = .17 C = 2.3 = SP

Planning Surveying Engineering

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/7/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: CCB / MWA

SAMPLE NUMBER: 91'

DESCRIPTION OF SAMPLE: SC

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 304.7

WEIGHT AFTER PREWASHING[2] (gm.): 226.2

WASHING LOSS[3] (gm.): 78.5

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
1/2	0	304.7	100
3/8	4.0	300.7	98.7
4	9.2	291.5	95.7
10	17.9	273.6	89.8
30	56.6	217.0	71.2
50	60.8	156.2	51.3
100	49.0	107.2	35.2
NUMBER 200	24.9	82.3	27.0

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 3.7

B. WASHING LOSS[3] (gm.): 78.5

TOTAL PASSING NO. 200 (gm.) (A + B): 82.2

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 304.6

ERROR (Original weight - total weight of fractions)(gm.): 0.1

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$ .03

REMARKS

L.L. = 28
P.L. = 19
P.I = 9

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25 A

NST Engineering Associates, Inc

Planning · Surveying · Engineering

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA			DATE 5/7/90
PROJECT S.I.A.D. REMEDIAL INVESTIGATION PHASE I		EXCAVATION NUMBER CCB 2MWA	SAMPLE NUMBER 35'
DESCRIPTION OF SAMPLE ML			PREWASHED ☒ YES ☐ NO
WEIGHT ORIGINAL SAMPLE (gm.) 136.8	WEIGHT AFTER PREWASHING (gm.) 64.9	WASHING LOSS (gm.) 71.9	

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	—	100
4	0	136.8	100
10	0.1	136.7	99.9
30	1.9	134.8	98.5
50	3.9	130.9	95.7
100	18.7	112.2	82.0
NUMBER 200	29.9	82.3	60.2

A. WEIGHT SIEVED THROUGH NO. 200 (gm.) 10.2	ERROR (Original weight - total weight of fractions)(gm.) .2
B. WASHING LOSS (gm.) 71.9	
TOTAL PASSING NO. 200 (gm.) (A + B) 82.1	PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}}$ x 100) .15
TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.) 136.6	

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature)	COMPUTED BY (Signature)	Job Number 90-25 A
Stephen H. Schmidt	Stephen H. Schmidt	

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/7/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: CCB 2 MWA

SAMPLE NUMBER: 100'

DESCRIPTION OF SAMPLE: S M

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 281.7

WEIGHT AFTER PREWASHING (gm.): 200.6

WASHING LOSS (gm.): 81.1

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	281.7	100
4	0.2	281.5	99.9
10	6.1	275.4	97.8
30	39.2	236.2	83.9
50	53.5	182.7	64.9
100	51.6	131.1	46.5
NUMBER 200	41.5	89.6	31.8

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 8.3

B. WASHING LOSS (gm.): 81.1

TOTAL PASSING NO. 200 (gm.) (A + B): 89.4

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 281.5

ERROR (Original weight - total weight of fractions)(gm.): .2

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .07

REMARKS

L.L. = 23
P.L. = 20
P.I = 3

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/4/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: CCB 1 SB

SAMPLE NUMBER: 40'

DESCRIPTION OF SAMPLE: SP

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 628.3

WEIGHT AFTER PREWASHING¹ (gm.): 615.5

WASHING LOSS¹ (gm.): 12.8

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	628.3	100
4	1.0	627.3	99.8
10	7.3	620.0	98.7
30	72.3	547.7	87.2
50	255.2	292.5	46.6
100	239.4	53.1	8.5
NUMBER 200	33.9	19.2	3.1

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 5.9

B. WASHING LOSS¹ (gm.): 12.8

TOTAL PASSING NO. 200 (gm.) (A. + B.): 18.7

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 627.8

ERROR (Original weight - total weight of fractions)(gm.): 0.5

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .08

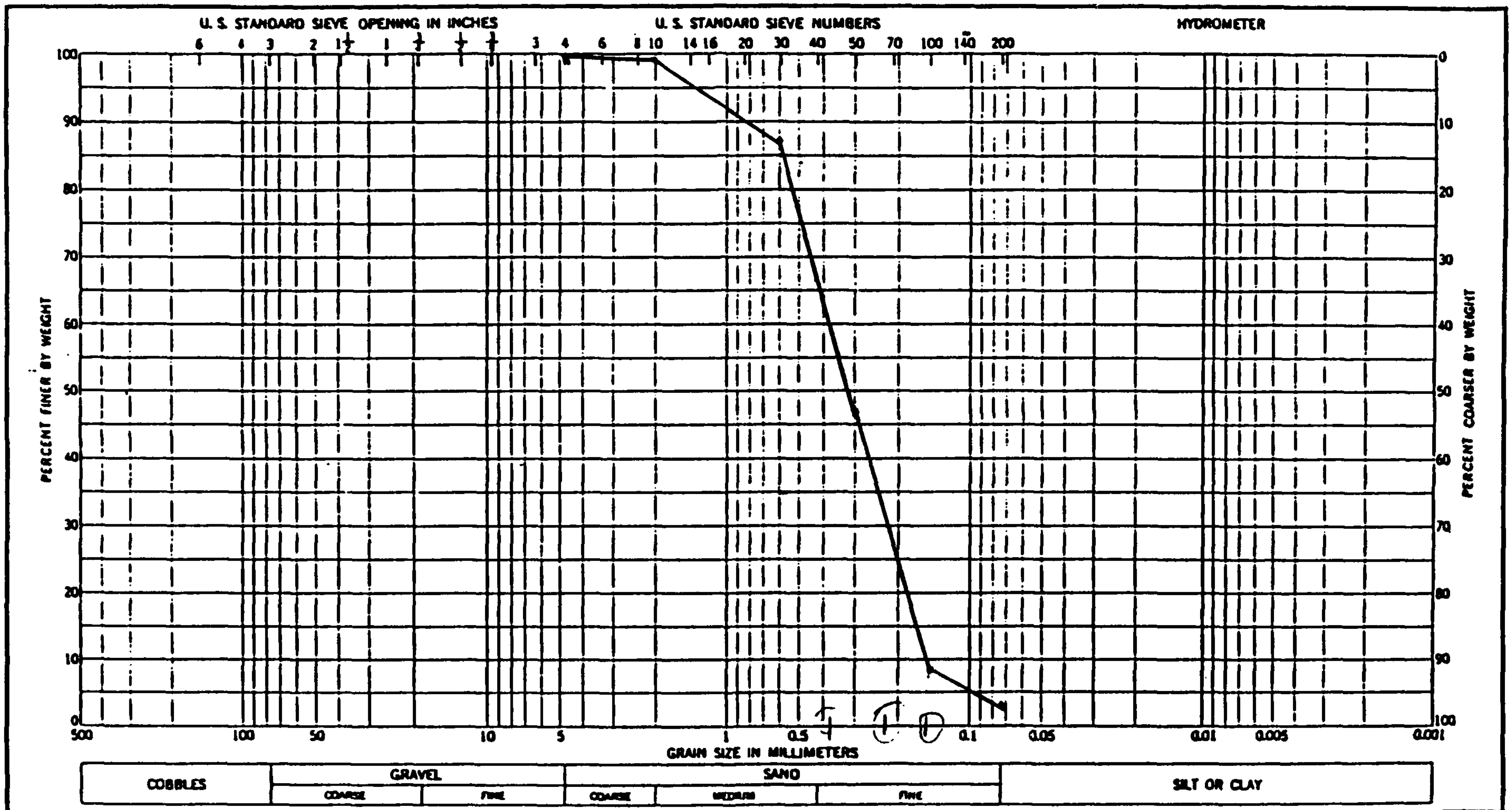
REMARKS

SAMPLE IS NON PLACTIC

TECHNICIAN (Signature): Stephen H. Schmitt

COMPUTED BY (Signature): Stephen H. Schmitt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. CCB 1 SB 40'

Date

GRADATION CURVES

ENG FORM 2087 D_{10} = .16
D [illegible] = [illegible].3 C [illegible] = [illegible]4

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

Planning Surveying Engineering

SIEVE ANALYSIS DATA

DATE	5/4/90
PROJECT	REMEDIAL INVESTIGATION S.I.A.D. PHASE I
EXCAVATION NUMBER	CCB 1 SB
SAMPLE NUMBER	70
DESCRIPTION OF SAMPLE	SM
PREWASHED	☒ YES ☐ NO
WEIGHT ORIGINAL SAMPLE (gm.)	561.2
WEIGHT AFTER PREWASHING[2] (gm.)	413.5
WASHING LOSS[3] (gm.)	147.7

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	561.2	100
4	1.0	560.2	99.8
10	5.5	554.7	98.8
30	36.8	517.9	92.3
50	97.0	420.9	75.0
100	153.6	267.3	47.6
NUMBER 200	107.0	160.3	28.6

A. WEIGHT SIEVED THROUGH NO. 200 (gm.)	12.0
B. WASHING LOSS[1] (gm.)	147.0
TOTAL PASSING NO. 200 (gm.) (A + B.)	159.7
TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.)	560.6
ERROR (Original weight - total weight of fractions)(gm.)	0.6
PERCENT ERROR (Error (gm.) / Original weight (gm.) x 100)	.11

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature)	COMPUTED BY (Signature)	Job Number
Stephen H. Schmitt	Stephen H. Schmitt	90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/7/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: CCB-2-SB

SAMPLE NUMBER: 40'

DESCRIPTION OF SAMPLE: SP-SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 569.9

WEIGHT AFTER PREWASHING[1] (gm.): 547.6

WASHING LOSS[1] (gm.): 22.3

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	569.9	100
4	2.8	567.1	99.5
10	5.1	562.0	98.6
30	64.0	498.0	87.4
50	265.8	232.2	40.7
100	159.0	73.2	12.8
NUMBER 200	43.3	29.9	5.3

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 2.1

B. WASHING LOSS[1] (gm.): 22.3

TOTAL PASSING NO. 200 (gm.) (A. + B.): 29.4

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 569.4

ERROR (Original weight - total weight of fractions)(gm.): 0.5

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .09

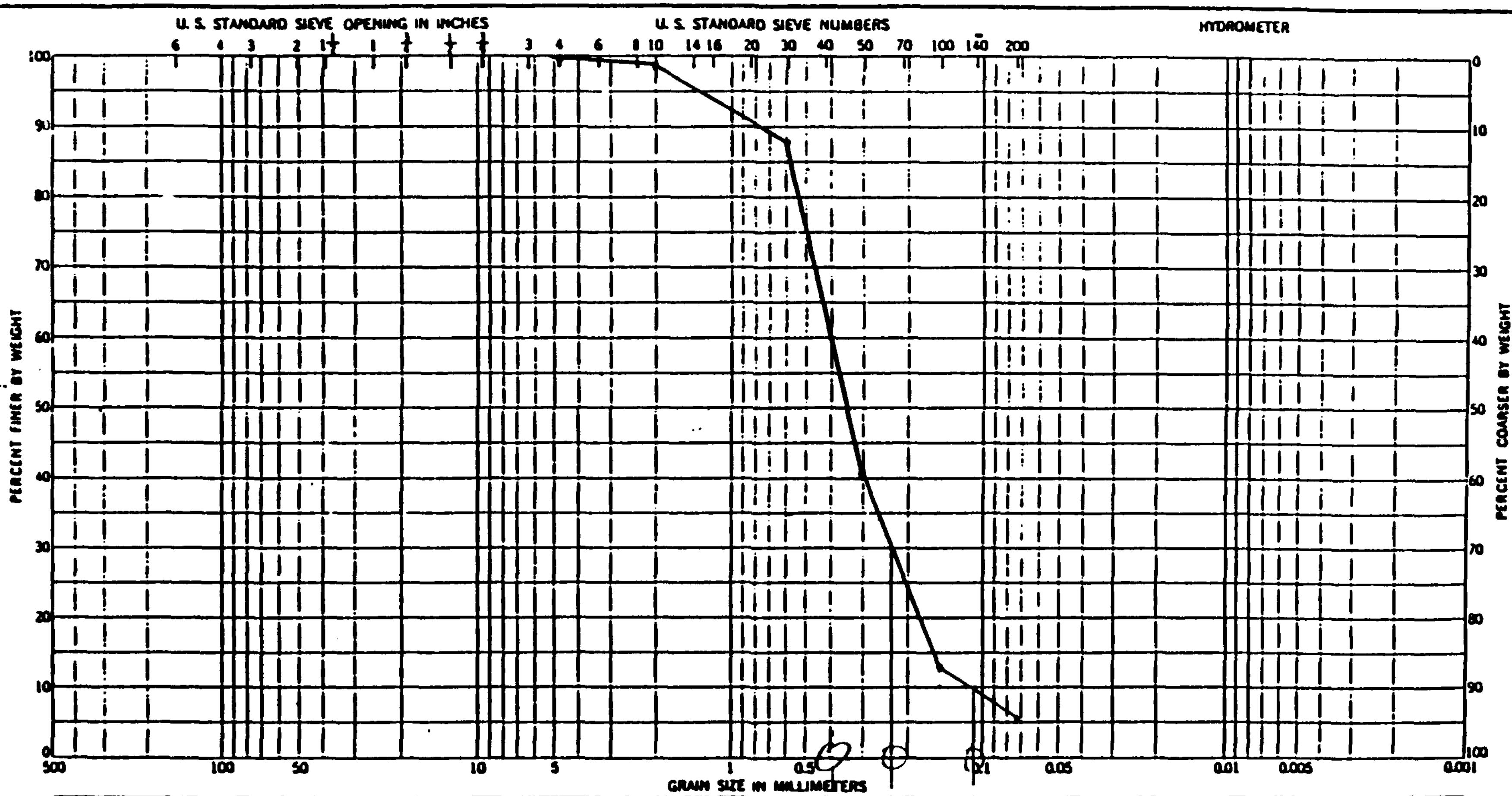
REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmidt

COMPUTED BY (Signature): Stephen H Schmidt

Job Number 90-25 A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. CCB - 2 - SB 40'

Date 4/12/90

GRADATION CURVES

ENG FORM 1 MAY 63 2087 D_{10} = .11 C - 3.6 = SP - SM

Planning · Surveying · Engineering

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/7/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: CCB-2-SB

SAMPLE NUMBER: 70'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 526.5

WEIGHT AFTER PREWASHING (gm.): 454.8

WASHING LOSS (gm.): 71.7

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	—	100
4	0	526.5	100
10	3.8	522.7	99.3
30	63.3	459.4	87.3
50	152.5	306.9	58.3
100	168.0	138.9	26.4
NUMBER 200	55.7	83.2	15.8

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 10.4

B. WASHING LOSS (gm.): 71.7

TOTAL PASSING NO. 200 (gm.) (A + B): 82.1

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 525.4

ERROR (Original weight - total weight of fractions)(gm.): 1.1

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .21

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A

Planning · Surveying · Engineering

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/7/90

PROJECT	EXCAVATION NUMBER	SAMPLE NUMBER
REMEDIAL INVESTIGATION S.I.A.D. PHASE I	CCB-03-SB	40'

DESCRIPTION OF SAMPLE: SP-SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.)	WEIGHT AFTER PREWASHING¹ (gm.)	WASHING LOSS¹ (gm.)
600.9	559.4	41.5

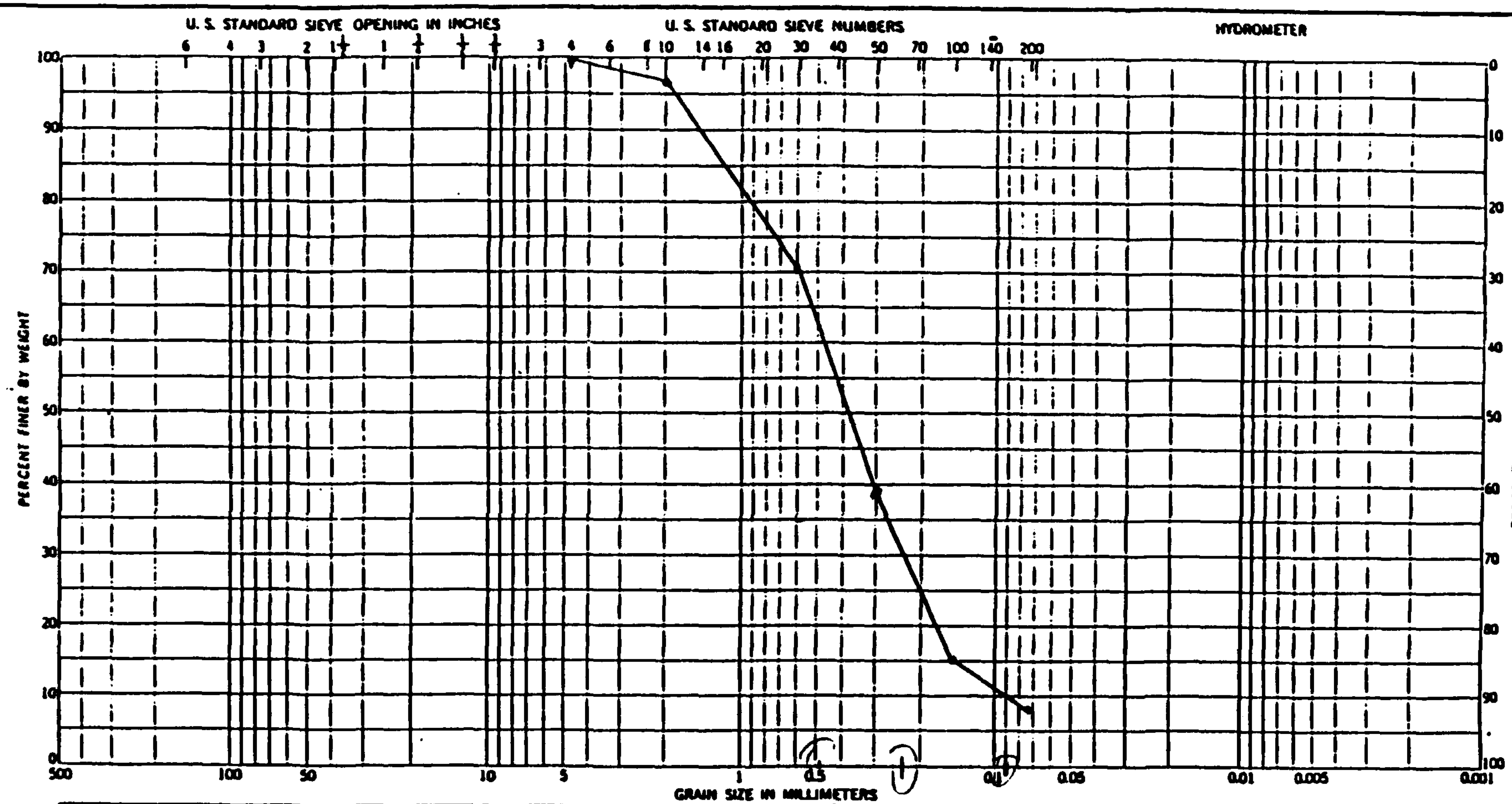
SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	600.9	100
4	1.1	599.8	99.8
10	15.8	584.0	97.2
30	159.8	424.2	70.6
50	188.5	235.7	39.2
100	142.9	92.8	15.4
NUMBER 200	42.1	50.7	8.4

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 8.6	ERROR (Original weight - total weight of fractions)(gm.): 0.6
B. WASHING LOSS¹ (gm.): 41.5	
TOTAL PASSING NO. 200 (gm.) (A + B): 50.1	PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .10
TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 600.3	

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature)	COMPUTED BY (Signature)	Job Number
[signature]	[signature]	90-25 A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. CCB - 03 - SB

Date 4/12/90

GRADATION CURVES

NST Engineering Associates, Inc

Planning • Surveying • Engineering

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/7/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: CCB 4 SB

SAMPLE NUMBER: 40'

DESCRIPTION OF SAMPLE: SP- SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.)	WEIGHT AFTER PREWASHING (gm.)	WASHING LOSS (gm.)
517.8	472.3	45.5

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
3/8	0	517.8	100
4	5.2	512.6	99.0
10	11.5	501.1	96.8
30	76.5	424.6	82.0
50	182.8	241.8	46.7
100	153.1	88.7	17.1
NUMBER 200	33.6	55.1	10.6

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 8.2

B. WASHING LOSS (gm.): 45.5

TOTAL PASSING NO. 200 (gm.) (A + B): 53.7

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 516.4

ERROR (Original weight - total weight of fractions)(gm.): 1.4

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$ .27

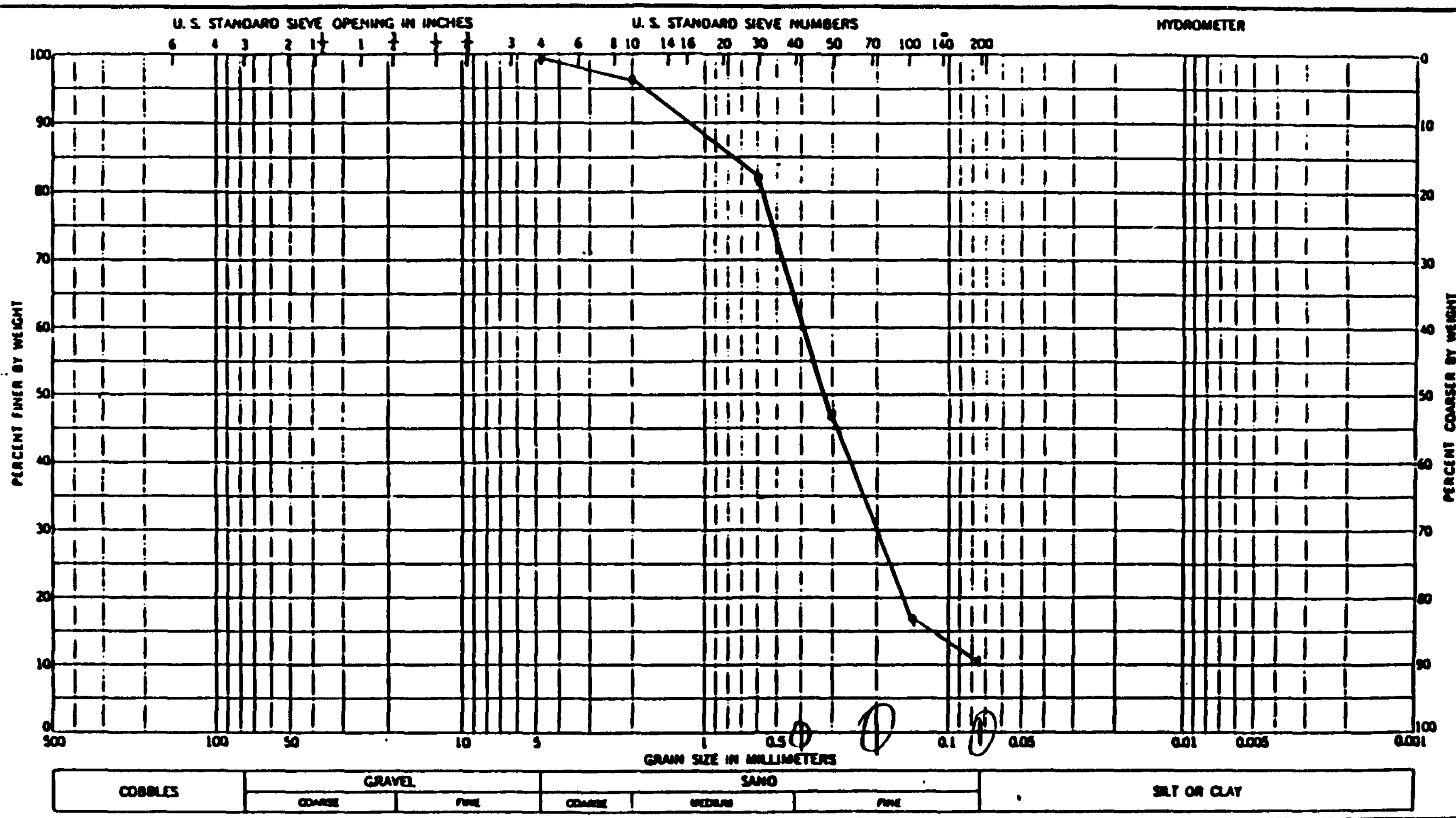
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmitt

COMPUTED BY (Signature): Stephen H. Schmitt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. CCB 4 SB 40'

Date 4/11/90

GRADATION CURVES

[redacted] G, [redacted], 20[redacted] D_{10} [redacted] = .425 [redacted] P [redacted] M [redacted]

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

Planning Surveying Engineering

SIEVE ANALYSIS DATA

DATE: 5/7/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: CCB 5 SB

SAMPLE NUMBER: 40'

DESCRIPTION OF SAMPLE: SP - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 773.7

WEIGHT AFTER PREWASHING (gm.): 724.2

WASHING LOSS (gm.): 49.5

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
1/2	0	773.7	100
3/8	1.5	772.2	99.8
4	6.7	765.5	98.9
10	36.0	729.5	94.3
30	145.9	583.6	75.4
50	264.8	318.8	41.2
100	194.7	124.1	16.0
NUMBER 200	60.6	63.5	8.2

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 12.6

B. WASHING LOSS (gm.): 49.5

TOTAL PASSING NO. 200 (gm.) (A + B): 62.1

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 772.3

ERROR (Original weight - total weight of fractions)(gm.): 1.4

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .18

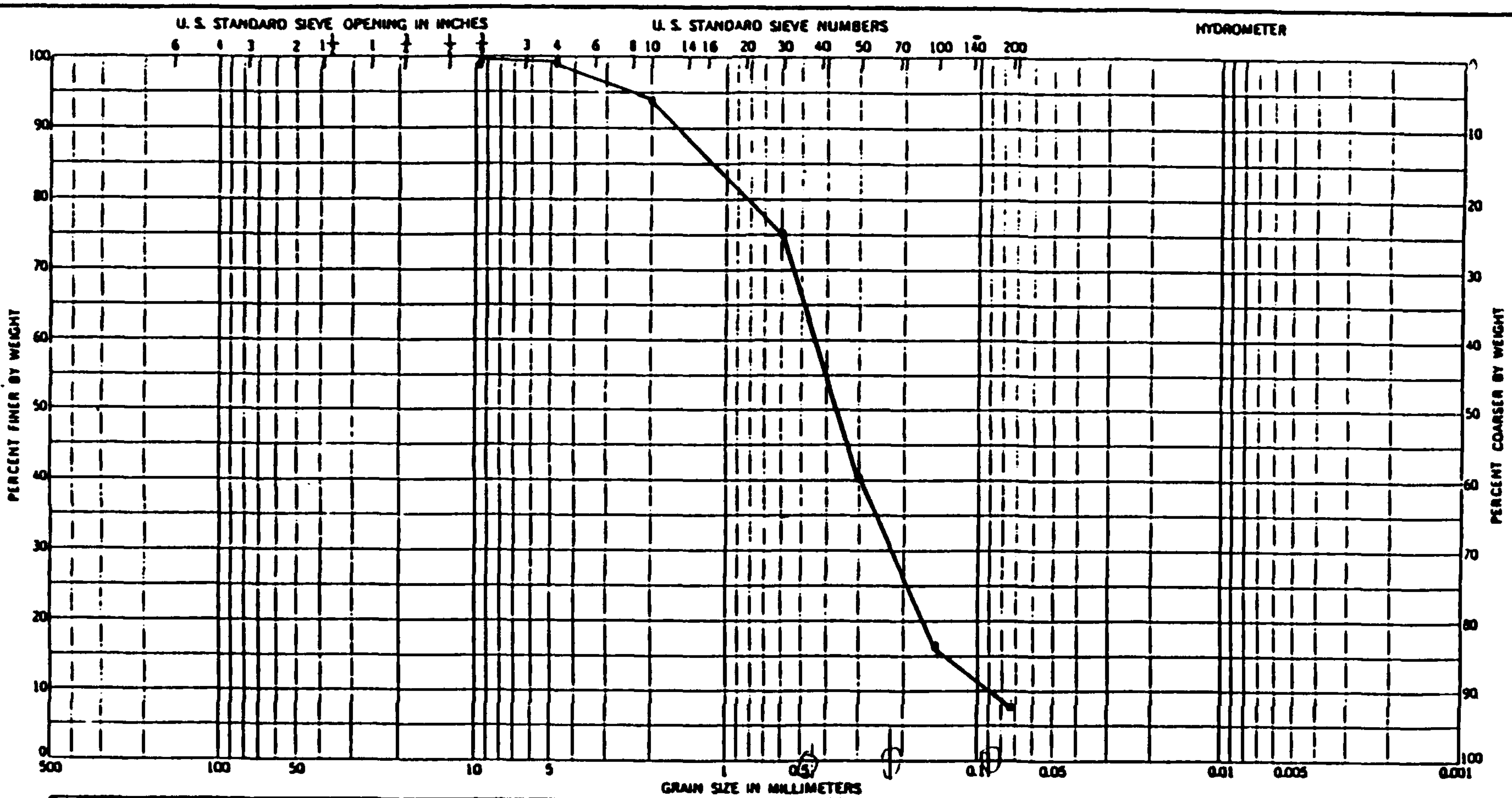
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. CCB 5 5B 40'

Date 4/11/90

GRADATION CURVES

ENG FORM MAY 63 2087

D_{10} = .09

D = .2 ... 60 ... 52 5

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/2/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DMO 3 MWA

SAMPLE NUMBER: 35'

DESCRIPTION OF SAMPLE: SW SM

PREWASHED: [X] YES [ ] NO

WEIGHT ORIGINAL SAMPLE (gm.): 140.0

WEIGHT AFTER PREWASHING (gm.): 129.9

WASHING LOSS (gm.): 10.1

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	140.0	100
4	5.9	134.1	95.8
10	24.4	109.7	78.4
30	38.9	70.8	50.6
50	17.9	52.9	37.8
100	21.8	31.1	22.2
NUMBER 200	18.5	12.6	9.0

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 2.2

B. WASHING LOSS (gm.): 10.1

TOTAL PASSING NO. 200 (gm.) (A + B): 12.3

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 139.7

ERROR (Original weight - total weight of fractions)(gm.): .3

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .21

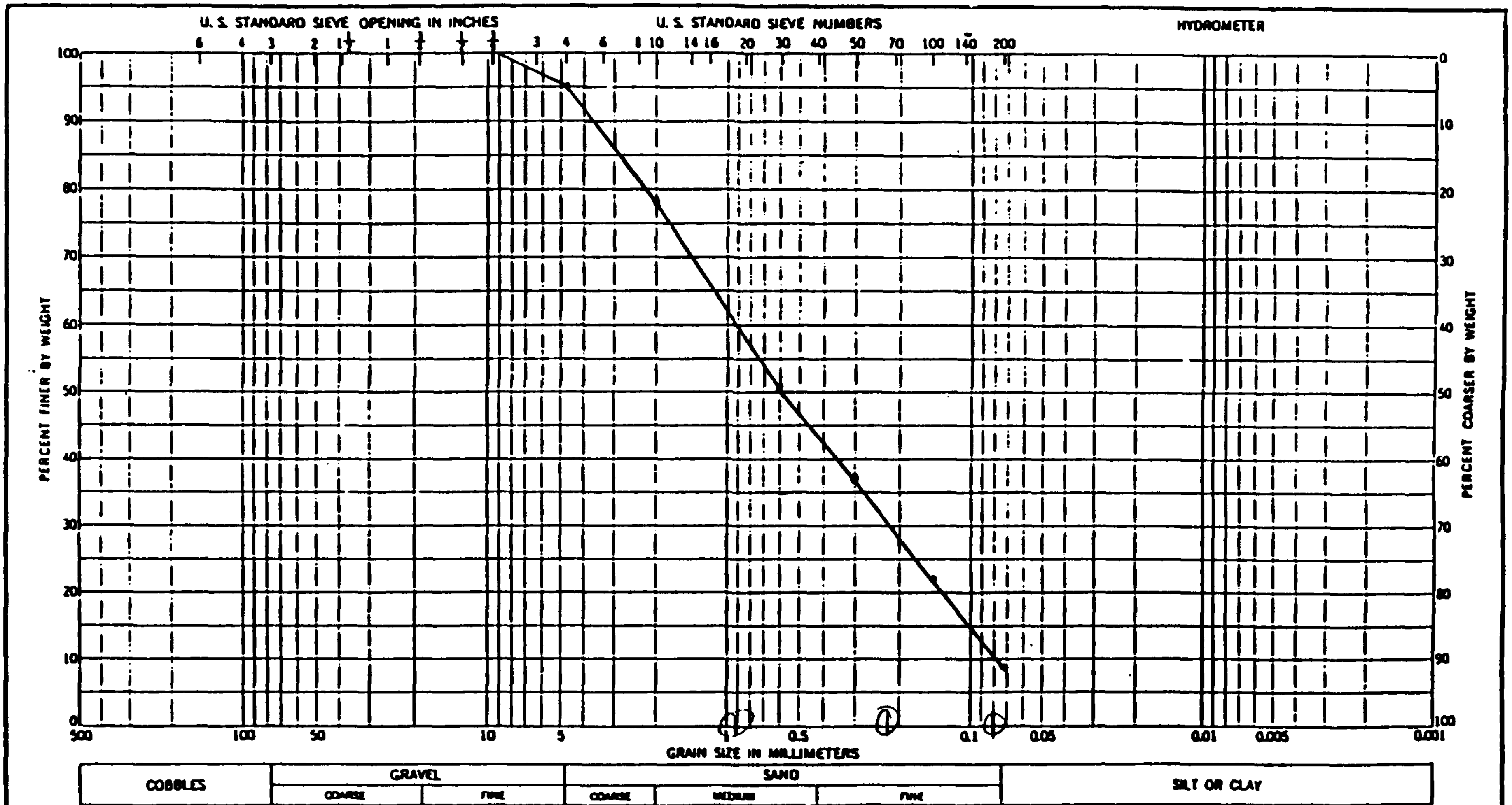
REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DMO 3 MWA 35'

Date 2/26/90

GRADATION CURVES

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

Planning Surveying Engineering

SIEVE ANALYSIS DATA

DATE: 5/3/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DMO 3 MWA

SAMPLE NUMBER: 100'

DESCRIPTION OF SAMPLE: SC

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.)	WEIGHT AFTER PREWASHING (gm.)	WASHING LOSS (gm.)
371.1	227.0	144.1

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
3/8	0	——	100
4	0	371.1	100
10	5.0	366.1	98.6
30	52.9	313.2	84.4
50	38.8	274.4	73.9
100	58.3	216.1	58.2
NUMBER 200	57.9	158.2	42.6

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 14.0

B. WASHING LOSS (gm.): 144.1

TOTAL PASSING NO. 200 (gm.) (A + B): 158.1

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 371.0

ERROR (Original weight − total weight of fractions)(gm.): .1

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .03

REMARKS:

L.L. = 28
P.L. = 20
P.I = 8

TECHNICIAN (Signature): Stephen H. Schmitt

COMPUTED BY (Signature): Stephen H. Schmitt

Job Number 90-25 A

Planning · Surveying · Engineering

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/2/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DMO 4MWA

SAMPLE NUMBER: 35'

DESCRIPTION OF SAMPLE: SP- SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 155.2

WEIGHT AFTER PREWASHING (gm.): 145.8

WASHING LOSS (gm.): 9.4

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	—	100
4	0	155.2	100
10	2.8	152.4	98.2
30	24.8	127.6	82.2
50	34.9	92.7	59.7
100	50.8	41.9	27.0
NUMBER 200	29.0	12.9	8.3

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 3.7

B. WASHING LOSS (gm.): 9.4

TOTAL PASSING NO. 200 (gm.) (A + B): 13.1

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 155.4

ERROR (Original weight - total weight of fractions)(gm.): .2

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .13

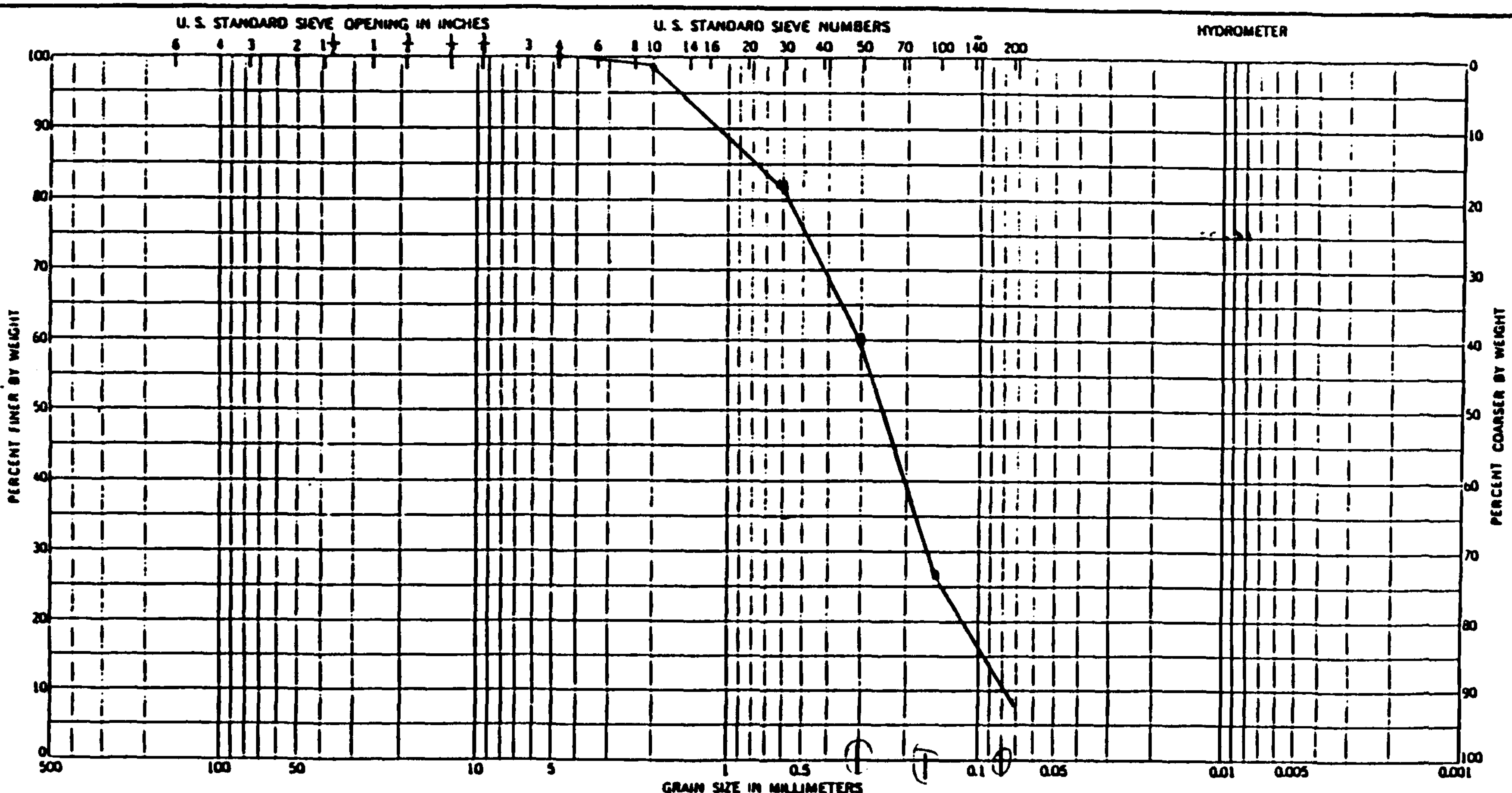
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DMO 4 MWA 35'

Date 2/28/90

GRADATION CURVES

FORM

$D_{10} = .08$

NST Engineering Associates, Inc

Planning · Surveying · Engineering

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/2/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DMO 4 MWA

SAMPLE NUMBER: 100'

DESCRIPTION OF SAMPLE: SC

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 368.7

WEIGHT AFTER PREWASHING[1] (gm.): 247.9

WASHING LOSS[1] (gm.): 120.8

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	368.7	100
4	1.4	367.3	99.6
10	11.0	356.3	96.6
30	66.2	290.1	78.7
50	73.8	216.3	58.7
100	54.3	162.0	43.9
NUMBER 200	32.7	129.3	35.1

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 8.7

B. WASHING LOSS[1] (gm.): 120.8

TOTAL PASSING NO. 200 (gm.) (A. + B.): 129.5

TOTAL WEIGHT OF FRACTIONS (Total of all entries in col. b) (gm.): 368.9

ERROR (Original weight - total weight of fractions)(gm.): .2

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .05

REMARKS

L.L. = 27
P.L. = 20
P.I = 7

TECHNICIAN (Signature): Stephen H Schmidt

COMPUTED BY (Signature): Stephen H Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/3/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: DMO 5 MWA

SAMPLE NUMBER: 35'

DESCRIPTION OF SAMPLE: SP-SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 386.7

WEIGHT AFTER PREWASHING (gm.): 351.5

WASHING LOSS (gm.): 35.2

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	—	100
4	0	386.7	100
10	0.7	386.0	99.8
30	14.8	371.2	96.0
50	53.5	317.7	82.2
100	167.5	148.2	38.3
NUMBER 200	102.8	45.4	11.7

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 10.5

B. WASHING LOSS (gm.): 35.2

TOTAL PASSING NO. 200 (gm.) (A + B): 45.7

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 387.0

ERROR (Original weight - total weight of fractions) (gm.): .3

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .08

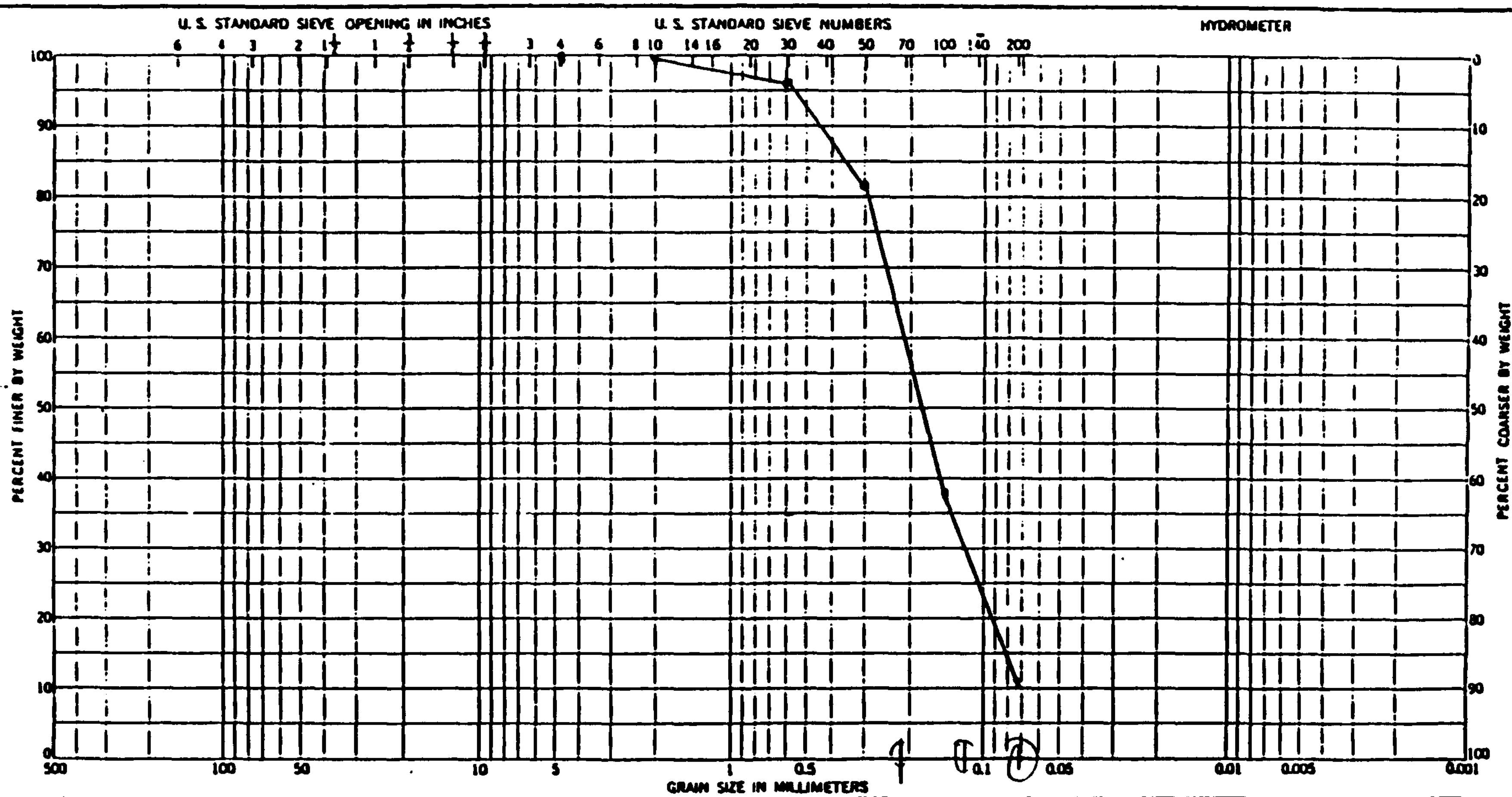
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmidt

COMPUTED BY (Signature): Stephen H Schmidt

Job Number 90-25 A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DMO 5 MWA 35'

Date 2/27/90

GRADATION CURVES

[redacted] FORM [redacted] 2087 D_{10} = .07

D_3 [redacted]

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/3/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DMO SMWA

SAMPLE NUMBER: 100'

DESCRIPTION OF SAMPLE: CL

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 257.1

WEIGHT AFTER PREWASHING (gm.): 133.5

WASHING LOSS (gm.): 123.6

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	257.1	100
4	0.9	256.2	99.7
10	3.9	252.3	98.1
30	13.3	239.0	93.0
50	20.0	219.0	85.2
100	37.7	181.3	70.5
NUMBER 200	42.8	138.5	53.9

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 14.9

B. WASHING LOSS (gm.): 123.6

TOTAL PASSING NO. 200 (gm.) (A + B): 138.5

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 257.1

ERROR (Original weight - total weight of fractions)(gm.): 0

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: 0

REMARKS

L.L. 32
P.L. 23
P.I. 9

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/2/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: OMO 6 SB

SAMPLE NUMBER: 30'

DESCRIPTION OF SAMPLE: SW

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 545.2

WEIGHT AFTER PREWASHING (gm.): 524.8

WASHING LOSS (gm.): 20.4

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	545.2	100
4	0.3	544.9	99.9
10	15.4	529.5	97.1
30	399.5	130.0	23.8
50	54.4	75.6	13.9
100	30.4	45.2	8.3
NUMBER 200	19.5	25.7	4.7

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 4.2

B. WASHING LOSS (gm.): 20.4

TOTAL PASSING NO. 200 (gm.) (A. + B.): 24.6

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 544.1

ERROR (Original weight - total weight of fractions)(gm.): 1.1

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$ .20

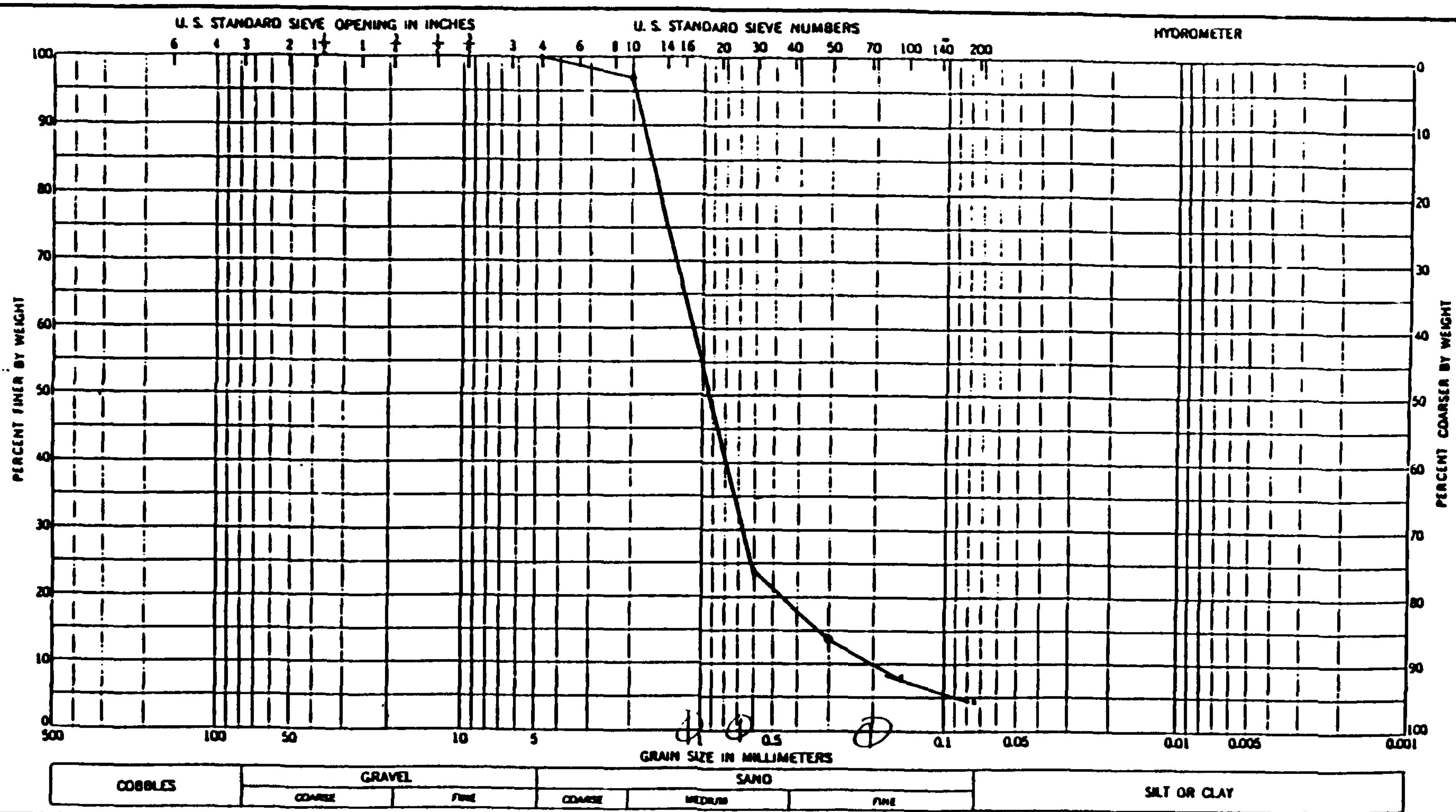
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmidt

COMPUTED BY (Signature): Stephen H Schmidt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DMO 6 SB 30'

Date 3/26/90

GRADATION CURVES

ENG FORM 2087 D_{10} = ,20 .476 1.90

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/2/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DMO 6 SB

SAMPLE NUMBER: 80'

DESCRIPTION OF SAMPLE: SP

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 510.2

WEIGHT AFTER PREWASHING (gm.): 494.4

WASHING LOSS (gm.): 15.8

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	510.2	100
4	8.4	501.8	98.4
10	38.5	463.3	90.8
30	134.6	328.7	64.4
50	174.4	154.3	30.2
100	115.5	38.8	7.6
NUMBER 200	19.9	18.9	3.7

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 2.2

B. WASHING LOSS (gm.): 15.8

TOTAL PASSING NO. 200 (gm.) (A. + B.): 18.0

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 509.3

ERROR (Original weight - total weight of fractions)(gm.): .9

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .18

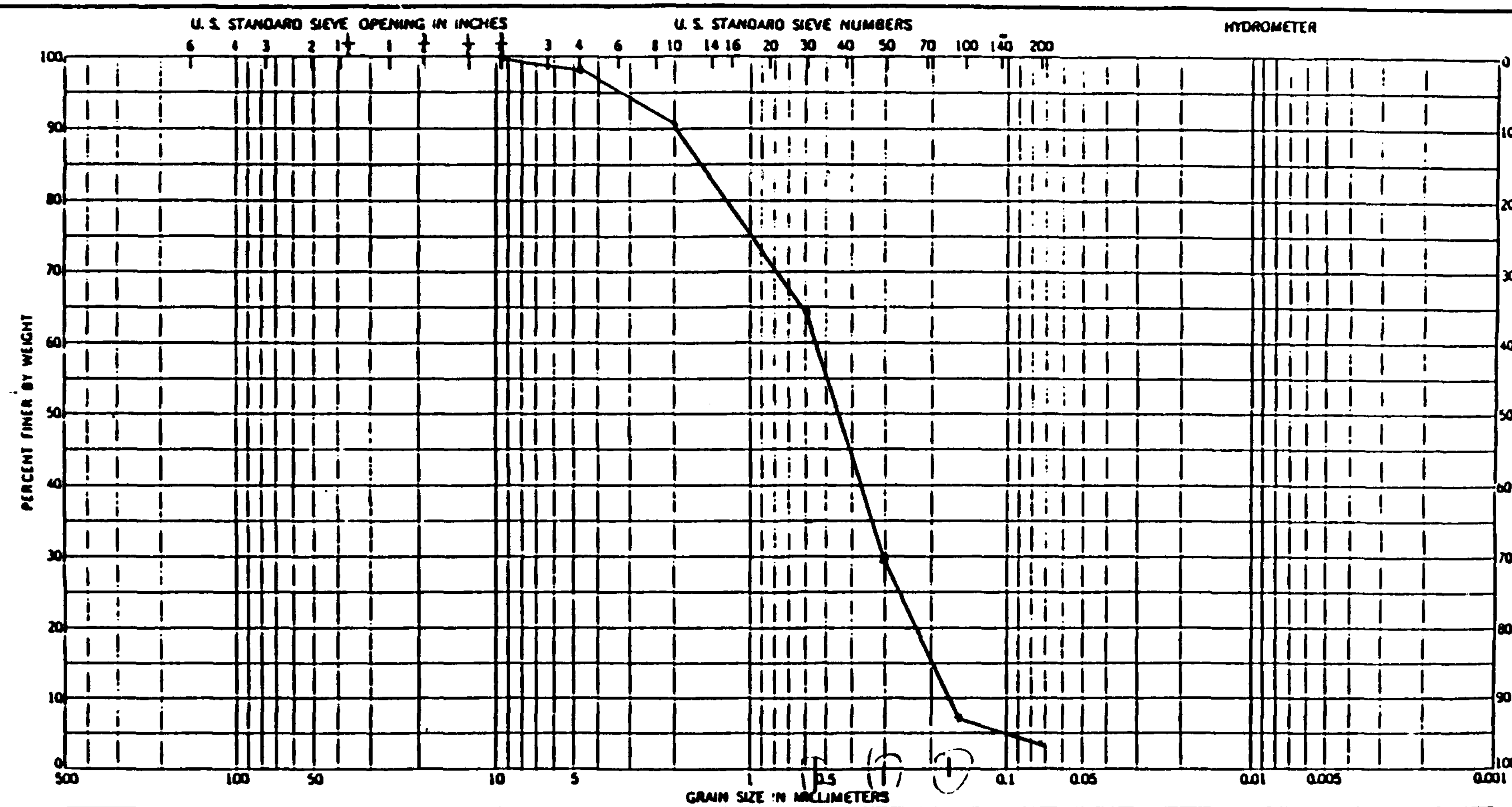
REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DMO 6 SB 80'

Date 3/26/90

GRADATION CURVES

ENG FORM 2087

D_{10} = .18

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/3/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: DMO 7 SB

SAMPLE NUMBER: 80'

DESCRIPTION OF SAMPLE: SP - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 573.0

WEIGHT AFTER PREWASHING (gm.): 546.4

WASHING LOSS (gm.): 26.6

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	573.0	100
4	8.2	564.8	98.6
10	31.2	533.6	93.1
30	216.6	317.0	55.3
50	191.4	125.6	21.9
100	66.0	59.6	10.4
NUMBER 200	25.4	34.2	6.0

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 6.5

B. WASHING LOSS (gm.): 26.6

TOTAL PASSING NO. 200 (gm.) (A + B): 33.1

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 571.9

ERROR (Original weight - total weight of fractions) (gm.): 1.1

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .19

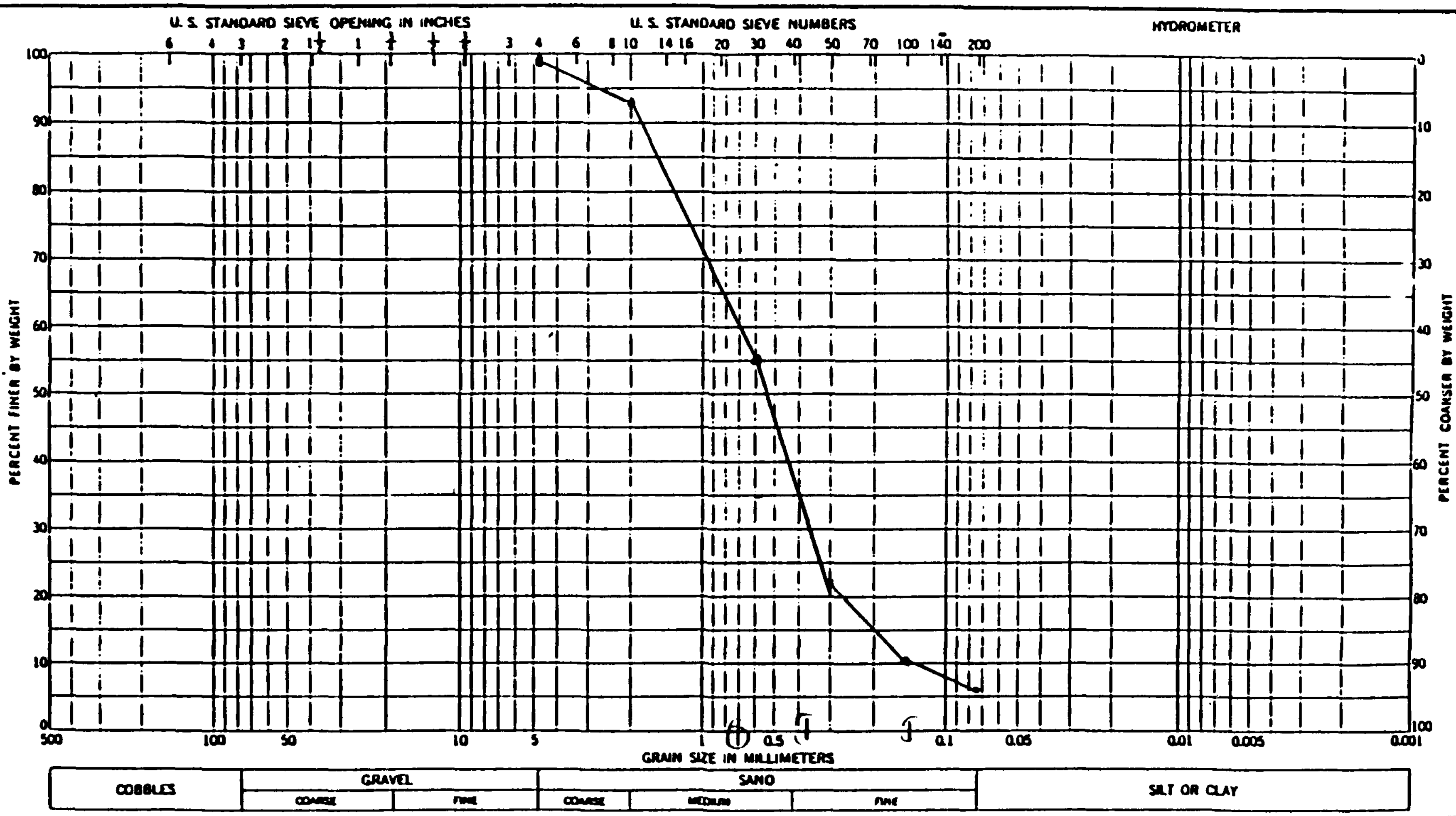
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DMO 7 SB 80'

Date 3/29/90

GRADATION CURVES

ENG FORM 2087 D_{10} = .15

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/2/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: OMO 8 SB

SAMPLE NUMBER: 1 35

DESCRIPTION OF SAMPLE: SW - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 623.6

WEIGHT AFTER PREWASHING[1] (gm.): 592.4

WASHING LOSS[1] (gm.): 31.2

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
1/2	0	623.6	100
3/8	3.5	620.1	99.4
4	5.0	615.1	98.6
10	73.3	541.8	86.9
30	336.4	205.4	32.9
50	58.4	147.0	23.6
100	60.0	87.0	14.0
NUMBER 200	53.0	34.0	5.5

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 3.0

B. WASHING LOSS[1] (gm.): 31.2

TOTAL PASSING NO. 200 (gm.) (A. + B.): 34.2

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 623.8

ERROR (Original weight - total weight of fractions)(gm.): .2

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .03

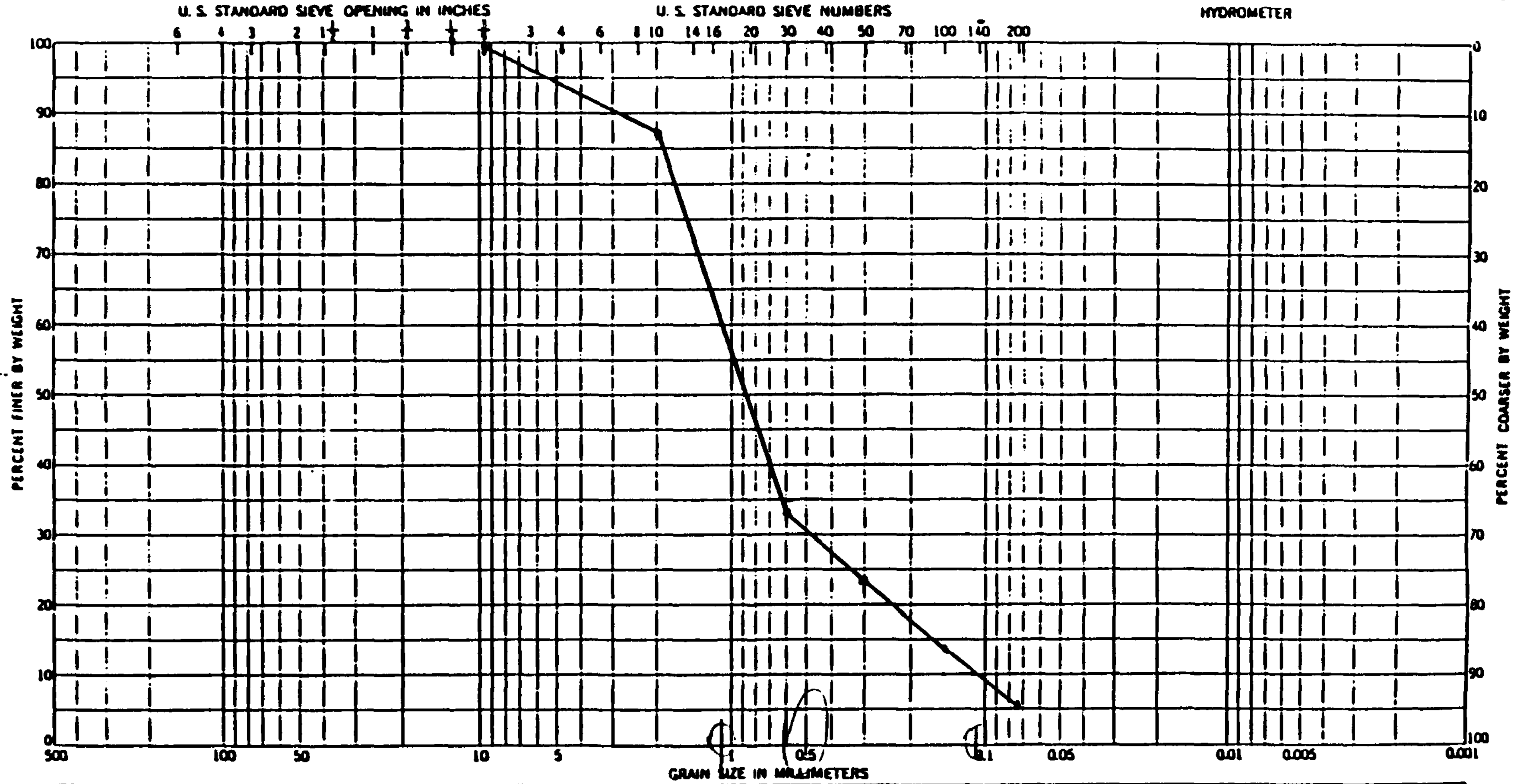
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DMO 8 SB 35'

Date

GRADATION CURVES

ENG FORM 2087 D_{10} = .12 .25

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/2/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I
EXCAVATION NUMBER: DMO 85B
SAMPLE NUMBER: 80'-81'

DESCRIPTION OF SAMPLE: SW - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 713.3
WEIGHT AFTER PREWASHING (gm.): 676.0
WASHING LOSS (gm.): 37.3

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
1/2	0	713.3	100
3/8	26.7	686.6	96.3
4	45.7	640.9	89.9
10	133.0	507.9	71.2
30	258.5	249.4	35.0
50	118.5	130.9	18.4
100	56.2	74.7	10.5
NUMBER 200	28.6	46.1	6.6

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 7.8

B. WASHING LOSS (gm.): 37.3

TOTAL PASSING NO. 200 (gm.) (A + B.): 45.1

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 712.3

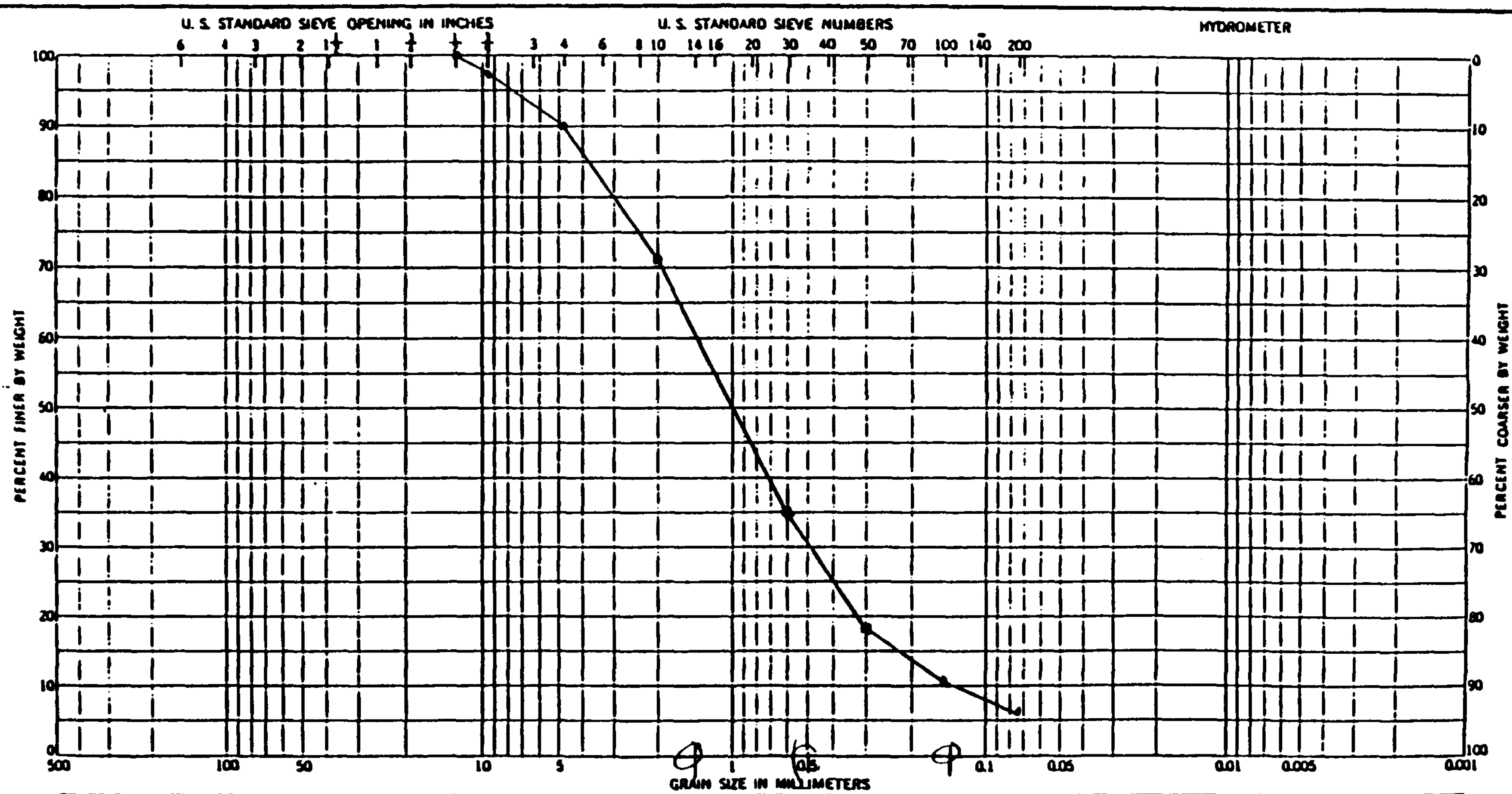
ERROR (Original weight - total weight of fractions)(gm.): 1.0

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$ .14

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]
COMPUTED BY (Signature): [signature]
Job Number 90-25A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DMO 8 SB 80'-81'

Date 3/27/90

GRADATION CURVES

FORM D_{10} = .15

NST Engineering Associates Inc

Planning · Surveying · Engineering

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/2/90

PROJECT	EXCAVATION NUMBER	SAMPLE NUMBER
S.I.A.D. REMEDIAL INVESTIGATION PHASE I	DMO 9 SB	40'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.)	WEIGHT AFTER PREWASHING (gm.)	WASHING LOSS (gm.)
474.8	361.5	113.3

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	474.8	100
4	1.3	473.5	99.7
10	28.5	445.0	93.7
30	91.0	354.0	74.6
50	85.6	268.4	56.5
100	73.6	194.8	41.0
NUMBER 200	59.1	135.7	28.6

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 21.5

B. WASHING LOSS (gm.): 113.3

TOTAL PASSING NO. 200 (gm.) (A + B): 134.8

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 473.9

ERROR (Original weight - total weight of fractions)(gm.): 0.9

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .19

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature)	COMPUTED BY (Signature)	Job Number
Stephen H. Schmitt	Stephen H. Schmitt	90-25 A

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

Planning Surveying Engineering

SIEVE ANALYSIS DATA			DATE 5/2/90
PROJECT REMEDIAL INVESTIGATION S.I.A.D. PHASE I		EXCAVATION NUMBER DMO 9 SB	SAMPLE NUMBER 80'
DESCRIPTION OF SAMPLE SP-SM			PREWASHED ☒ YES ☐ NO
WEIGHT ORIGINAL SAMPLE (gm.) 546.0	WEIGHT AFTER PREWASHING (gm.) 524.8		WASHING LOSS (gm.) 21.2

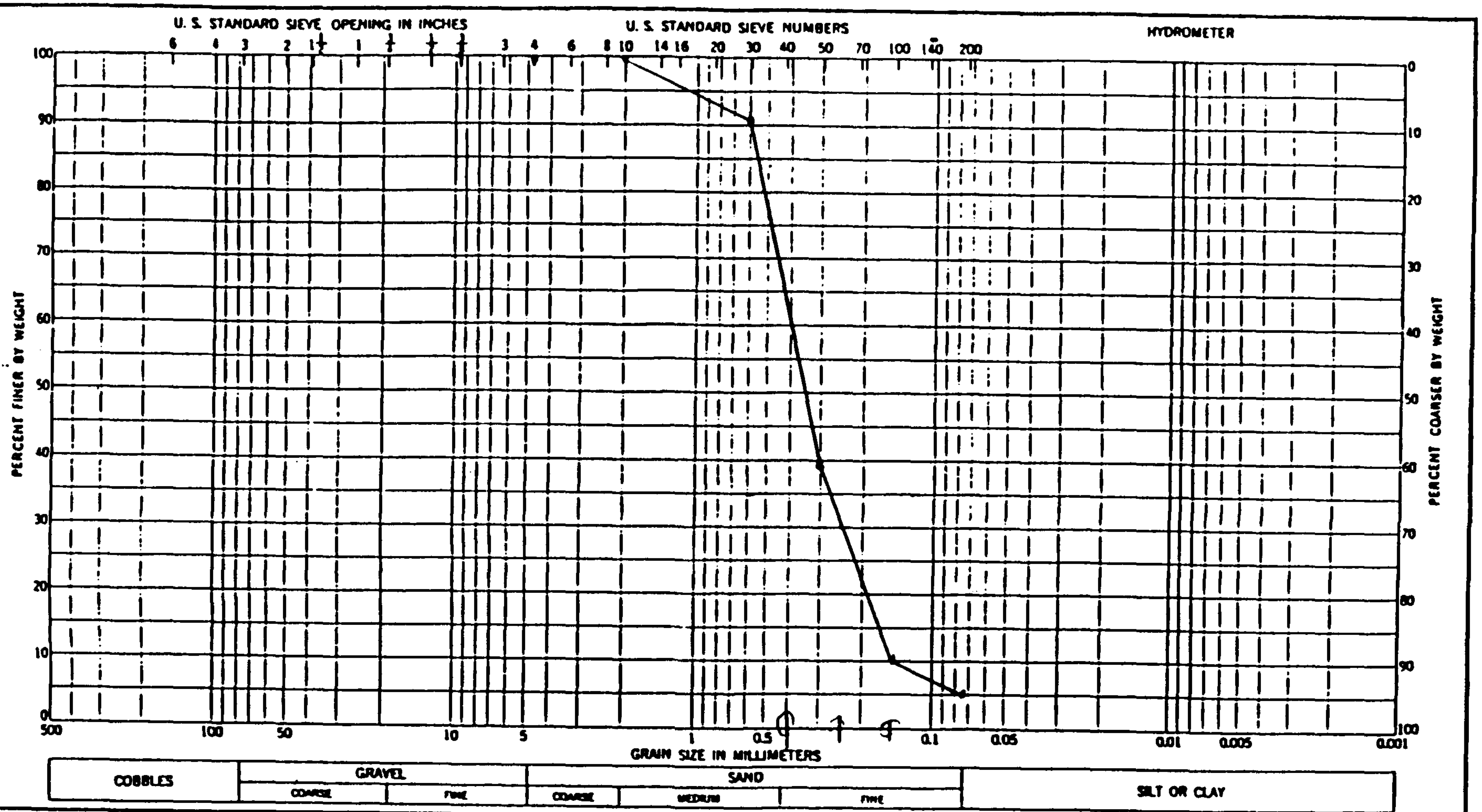
SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	546.0	100
4	0.2	545.8	99.9
10	1.1	544.7	99.8
30	48.7	496.0	90.8
50	283.0	213.0	39.0
100	157.0	56.0	10.3
NUMBER 200	28.0	28.0	5.1

A. WEIGHT SIEVED THROUGH NO. 200 (gm.) 6.0	ERROR (Original weight - total weight of fractions)(gm.) 0.8
B. WASHING LOSS (gm.) 21.2	
TOTAL PASSING NO. 200 (gm.) (A + B.) 27.2	PERCENT ERROR (Error (gm.) / Original weight (gm.) × 100) .15
TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.) 545.2	

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature)	COMPUTED BY (Signature)	Job Number 90-25 A
Stephen H Schmitt	Stephen H Schmitt	



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DMO 9 53 80'

Date 3/28/90

GRADATION CURVES

ENG FORM 1 MAY 63 2087

D10 = .15
D30 = .25 Cu 2.7
D60 = .40

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/3/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: OMO 10 SB

SAMPLE NUMBER: 40'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 600.7

WEIGHT AFTER PREWASHING (gm.): 457.9

WASHING LOSS (gm.): 142.8

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	600.7	100
4	1.1	599.6	99.8
10	25.2	574.4	95.6
30	196.0	378.4	63.0
50	50.5	327.9	54.6
100	68.7	259.2	43.2
NUMBER 200	95.5	163.7	27.3

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 19.7

B. WASHING LOSS (gm.): 142.8

TOTAL PASSING NO. 200 (gm.) (A + B): 162.5

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 599.5

ERROR (Original weight − total weight of fractions) (gm.): 1.2

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .20

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/3/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DMO 11 SB

SAMPLE NUMBER: 40'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 470.1

WEIGHT AFTER PREWASHING (gm.): 294.2

WASHING LOSS (gm.): 175.9

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	470.1	100
4	0.2	469.9	99.9
10	3.4	466.5	99.2
30	57.0	409.5	87.1
50	40.5	369.0	78.5
100	65.4	303.6	64.6
NUMBER 200	97.8	205.8	43.8

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 29.6

B. WASHING LOSS (gm.): 175.9

TOTAL PASSING NO. 200 (gm.) (A + B): 205.5

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 469.8

ERROR (Original weight - total weight of fractions)(gm.): .3

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .06

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmidt

COMPUTED BY (Signature): Stephen H Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/2/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DMO 12 SB

SAMPLE NUMBER: 50

DESCRIPTION OF SAMPLE: SM

PREWASHED: [X] YES [ ] NO

WEIGHT ORIGINAL SAMPLE (gm.): 675.0

WEIGHT AFTER PREWASHING (gm.): 598.4

WASHING LOSS (gm.): 76.6

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
1/2	0	675.0	100
3/8	3.7	671.3	99.5
4	10.2	661.1	97.9
10	55.9	605.2	89.7
30	175.3	429.9	63.7
50	148.6	281.3	41.7
100	111.7	169.6	25.1
NUMBER 200	81.6	88.0	13.0

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 11.3

B. WASHING LOSS (gm.): 76.6

TOTAL PASSING NO. 200 (gm.) (A + B.): 87.9

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 674.9

ERROR (Original weight - total weight of fractions)(gm.): .1

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .01

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/2/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DMO 13 SB

SAMPLE NUMBER: 50'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 520.9

WEIGHT AFTER PREWASHING (gm.): 456.5

WASHING LOSS (gm.): 64.4

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	520.9	100
4	1.9	519.0	99.6
10	28.6	490.4	94.1
30	129.1	361.3	69.4
50	108.1	253.2	48.6
100	103.2	150.0	28.8
NUMBER 200	69.0	81.0	15.6

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 16.2

B. WASHING LOSS (gm.): 64.4

TOTAL PASSING NO. 200 (gm.) (A. + B.): 80.6

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 520.5

ERROR (Original weight - total weight of fractions)(gm.): .4

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .08

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/8/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: TNT 15 MWA

SAMPLE NUMBER: 70'

DESCRIPTION OF SAMPLE: SP

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 371.6

WEIGHT AFTER PREWASHING (gm.): 365.1

WASHING LOSS (gm.): 6.5

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	371.6	100
4	0.3	371.3	99.9
10	4.7	366.6	98.7
30	84.7	281.9	75.9
50	120.2	161.7	43.5
100	135.5	26.2	7.1
NUMBER 200	18.7	7.5	2.0

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 0.6

B. WASHING LOSS (gm.): 6.5

TOTAL PASSING NO. 200 (gm.) (A. + B.): 7.1

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 371.2

ERROR (Original weight - total weight of fractions)(gm.): 0.4

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .11

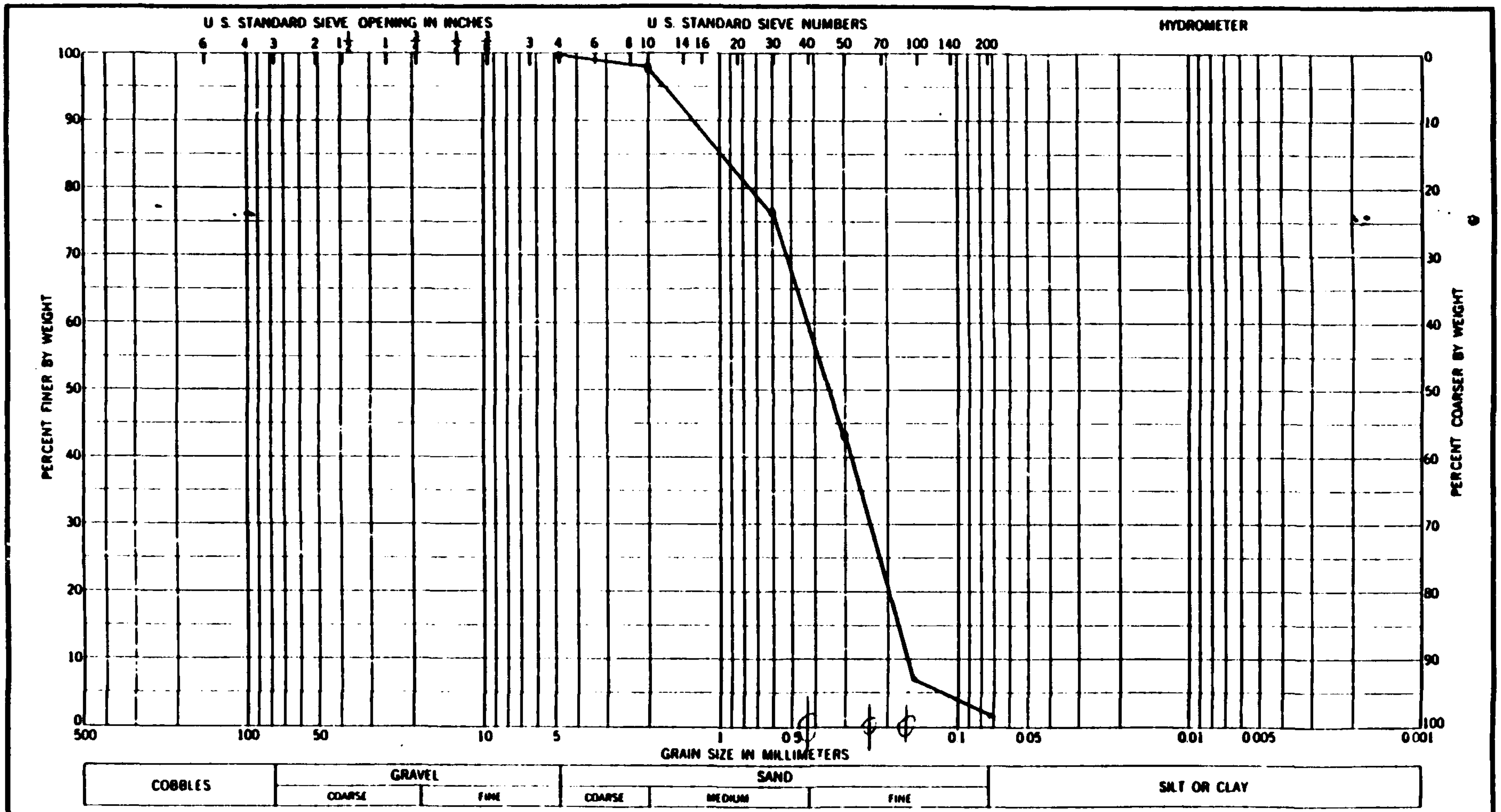
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A



Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No TNT 15 MWA 20'

Date 2/27/90

GRADATION CURVES

ENG FORM 2087

D_{10} = .17

SP

Planning Surveying Engineering

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/8/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: TNT 16MWA

SAMPLE NUMBER: 59.5-61

DESCRIPTION OF SAMPLE: SP - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 472.9

WEIGHT AFTER PREWASHING (gm.): 452.1

WASHING LOSS (gm.): 20.8

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	472.9	100
4	0.5	472.4	99.9
10	36.2	436.2	92.2
30	242.8	193.4	40.9
50	71.1	122.3	25.9
100	67.1	55.2	11.7
NUMBER 200	30.7	24.5	5.2

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 3.1

B. WASHING LOSS (gm.): 20.8

TOTAL PASSING NO. 200 (gm.) (A + B): 23.9

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 472.3

ERROR (Original weight - total weight of fractions)(gm.): .6

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .13

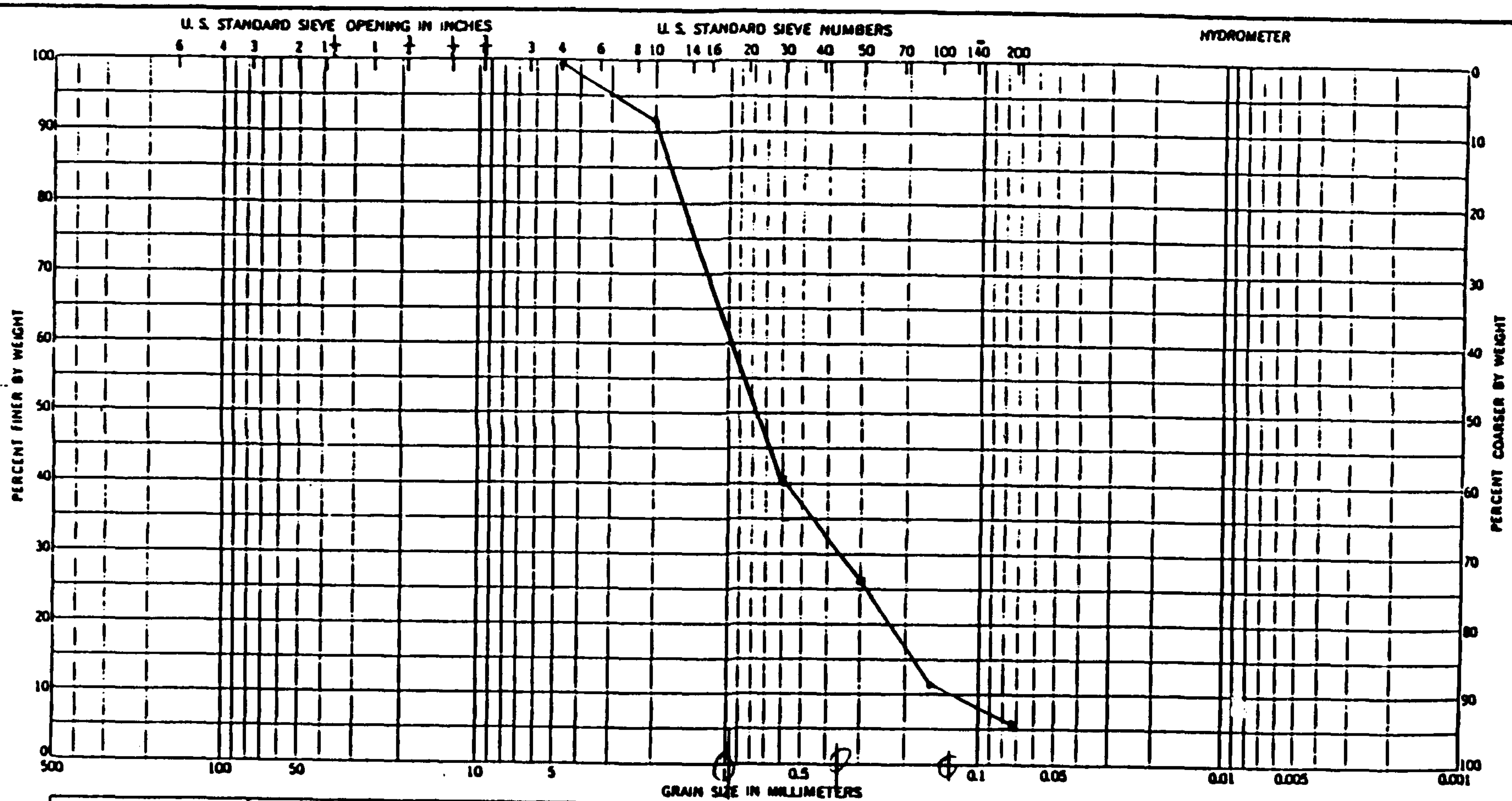
REMARKS

SAMPLE IS NON - PLASTIC

TECHNICIAN (Signature): Stephen H Schmidt

COMPUTED BY (Signature): Stephen H Schmidt

Job Number 90-25 A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. TNT 16 MWA 59.5'-61'

Date 2/28/90

GRADATION CURVES

FORM 208 [redacted] D_{10} = .14 [redacted] 1256 [redacted]

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA		DATE 5/8/90
PROJECT REMEDIAL INVESTIGATION S.I.A.D. PHASE I	EXCAVATION NUMBER TNT 16MWA	SAMPLE NUMBER 69.5'-71'
DESCRIPTION OF SAMPLE SP-SM		PREWASHED ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.)	WEIGHT AFTER PREWASHING[1] (gm.)	WASHING LOSS[1] (gm.)
420.8	391.5	29.3

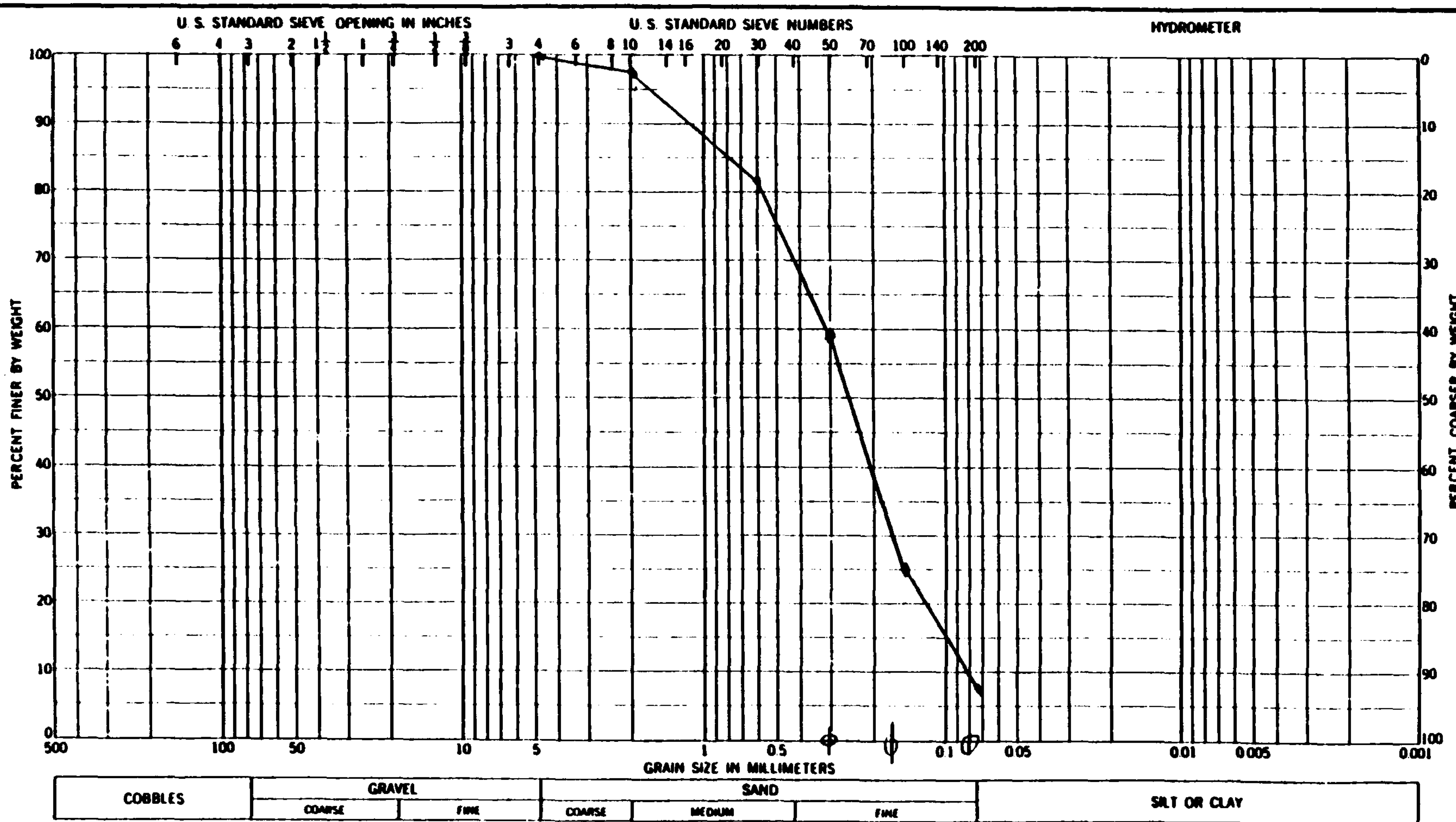
SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	420.8	100
4	0.2	420.6	99.9
10	12.1	408.5	97.1
30	63.2	345.3	82.1
50	98.1	247.2	58.8
100	139.7	107.5	25.6
NUMBER 200	73.5	34.0	8.1

A. WEIGHT SIEVED THROUGH NO. 200 (gm.) 3.5	ERROR (Original weight - total weight of fractions)(gm.) 1.2
B. WASHING LOSS[1] (gm.) 29.3	
TOTAL PASSING NO. 200 (gm.) (A + B.) 32.8	PERCENT ERROR (Error (gm.) / Original weight (gm.) × 100) .29
TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.) 419.6	

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature)	COMPUTED BY (Signature)	Job Number 90-25 A
Stephen H Schmitt	Stephen H Schmitt	



Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No TNT 16 MWA 695'-71'

Date 2/28/90

GRADATION CURVES

ENG FORM 1 MAY 63 2087

D_{10} = .08
D_{30} = .18
D_{60} = .30

Cu 3.8

SP - SM

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/8/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: TNT 7 SB

SAMPLE NUMBER: 25'

DESCRIPTION OF SAMPLE: SP - SM

PREWASHED: [X] YES [ ] NO

WEIGHT ORIGINAL SAMPLE (gm.): 559.5

WEIGHT AFTER PREWASHING (gm.): 522.8

WASHING LOSS (gm.): 36.7

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
1/2	0	559.5	100
3/8	2.1	557.4	99.6
4	2.9	554.5	99.1
10	18.5	536.0	95.8
30	128.2	407.8	72.9
50	148.9	258.9	46.3
100	144.2	114.7	20.5
NUMBER 200	63.4	51.3	9.2

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 15.1

B. WASHING LOSS (gm.): 36.7

TOTAL PASSING NO. 200 (gm.) (A. + B.): 51.8

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 560.0

ERROR (Original weight - total weight of fractions)(gm.): .5

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .09

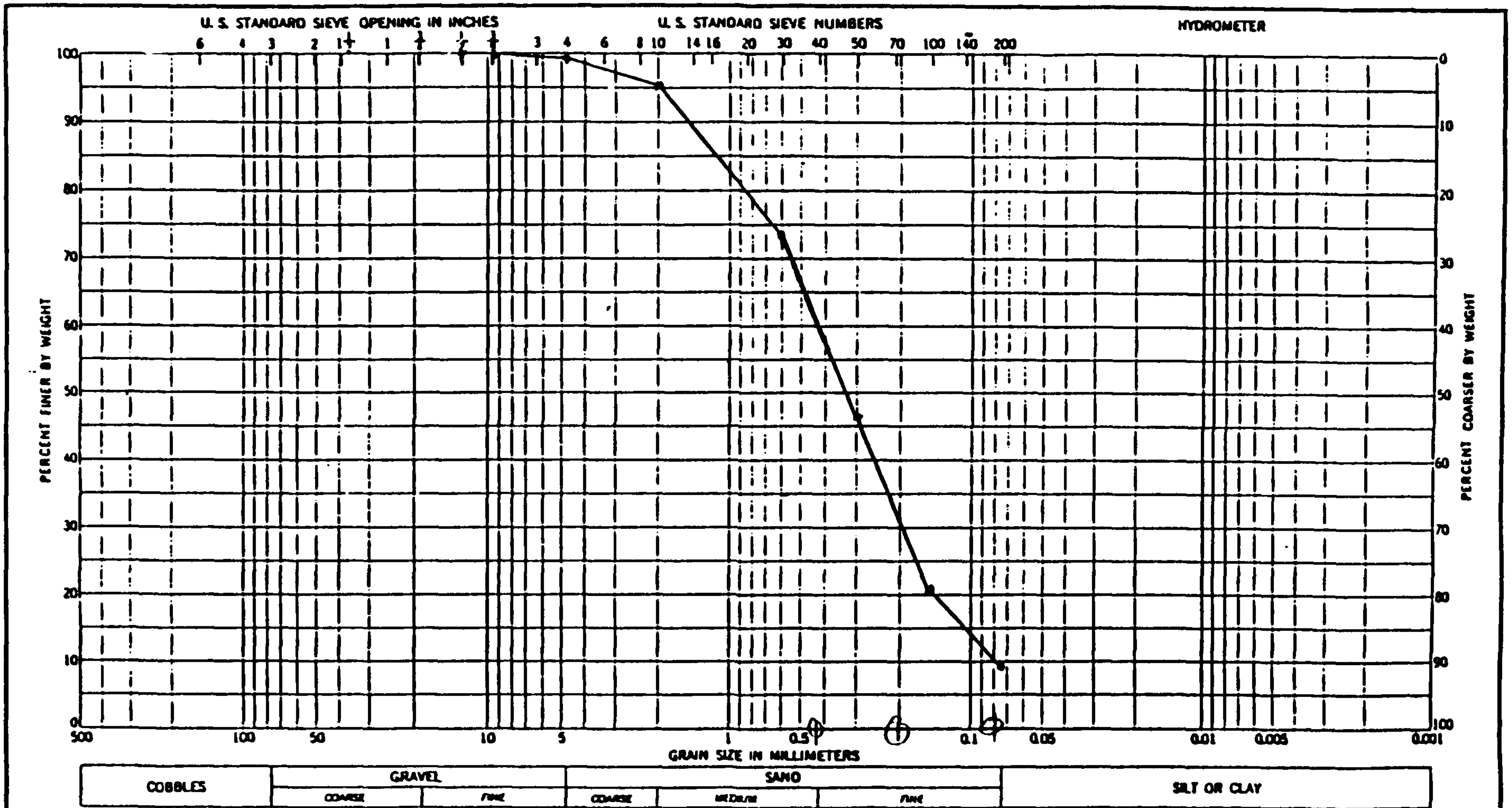
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature):

COMPUTED BY (Signature):

Job Number 90-25A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. TNT 7 SB 25'

Date 4/3/90

GRADATION CURVES

ENG FORM 2087

D_{10} = .08

D

SP - SM

NST Engineering Associates, Inc

Planning · Surveying · Engineering

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/8/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: TNT 8 SB

SAMPLE NUMBER: 25'

DESCRIPTION OF SAMPLE: SW - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.)	WEIGHT AFTER PREWASHING[1] (gm.)	WASHING LOSS[2] (gm.)
599.7	561.3	38.4

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	599.7	100
4	1.4	598.3	99.8
10	19.5	578.8	96.5
30	157.5	421.3	70.3
50	155.3	266.0	44.4
100	122.4	143.6	24.0
NUMBER 200	75.0	68.6	11.4

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 29.0

B. WASHING LOSS[2] (gm.): 38.4

TOTAL PASSING NO. 200 (gm.) (A + B): 67.4

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 598.5

ERROR (Original weight - total weight of fractions)(gm.): 1.2

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .20

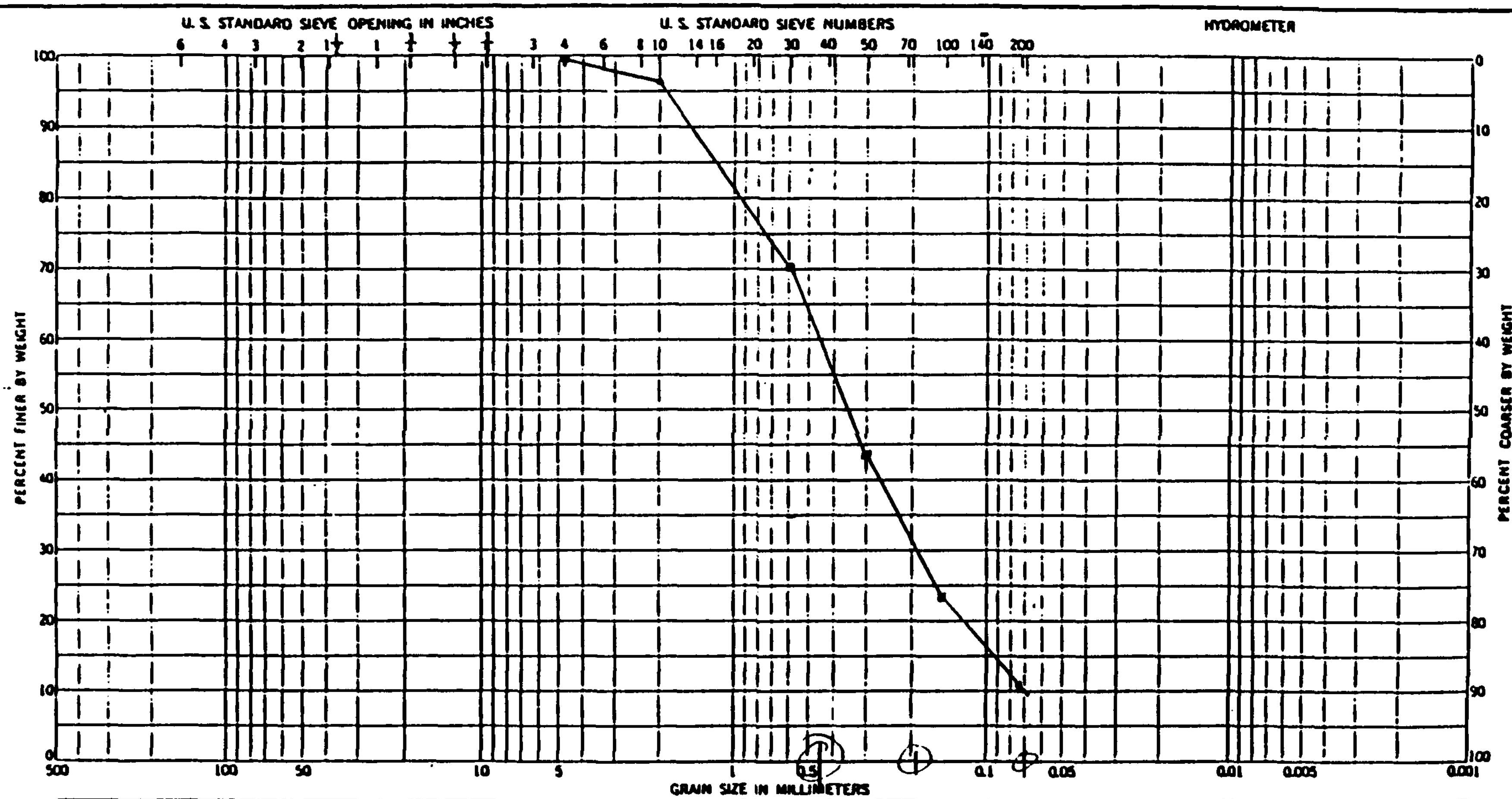
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmitt

COMPUTED BY (Signature): Stephen H. Schmitt

Job Number 90-25 A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. TNT 8 SB 25'

Date

GRADATION CURVES

ENG FORM 2087

D_{10} = .07 D_{30} ... .036 ... SM

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/8/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: TNT 9 SB

SAMPLE NUMBER: 25'

DESCRIPTION OF SAMPLE: SW - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.)	WEIGHT AFTER PREWASHING[1] (gm.)	WASHING LOSS[1] (gm.)
616.7	572.8	43.9

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
1/2	0	616.7	100
3/8	3.2	613.5	99.5
4	4.8	608.7	98.7
10	46.0	562.7	91.2
30	212.5	350.2	56.8
50	153.0	197.2	32.0
100	89.4	107.8	17.5
NUMBER 200	48.5	59.3	9.6

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 14.8

B. WASHING LOSS[1] (gm.): 43.9

TOTAL PASSING NO. 200 (gm.) (A. + B.): 58.7

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 616.1

ERROR (Original weight - total weight of fractions)(gm.): 0.6

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .10

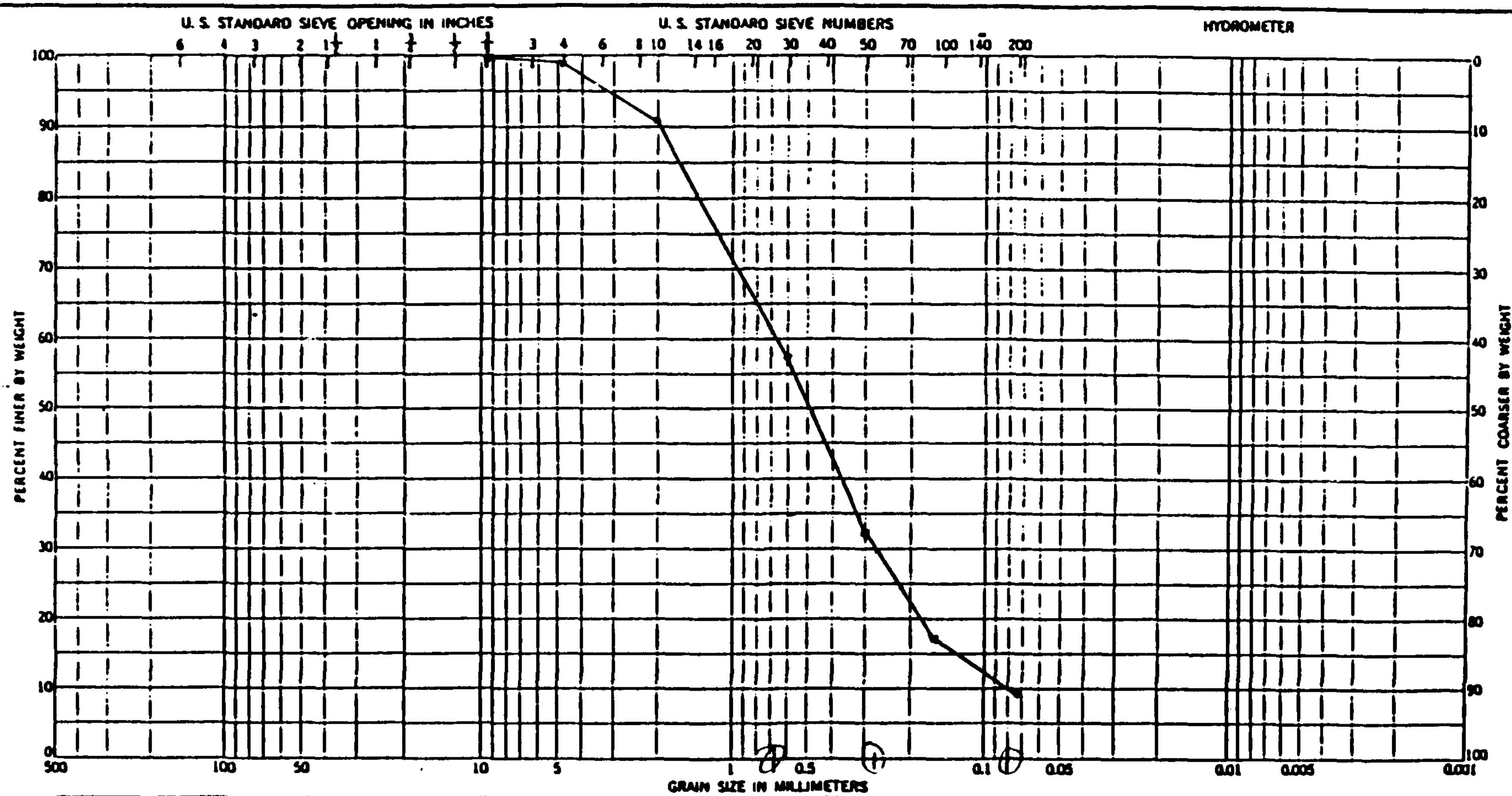
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25 A



<table>
<tr><td rowspan="2">COBBLES</td><td colspan="2">GRAVEL</td><td colspan="3">SAND</td><td rowspan="2">SILT OR CLAY</td></tr>
<tr><td>COARSE</td><td>FINE</td><td>COARSE</td><td>MEDIUM</td><td>FINE</td></tr>
</table>

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. TNT 9 SB 25'

Date 4/3/90

GRADATION CURVES

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/8/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: TNT 10 S3

SAMPLE NUMBER: 25

DESCRIPTION OF SAMPLE: SW - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 686.6

WEIGHT AFTER PREWASHING (gm.): 649.2

WASHING LOSS (gm.): 37.4

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
1/2	0	686.6	100
3/8	8.1	678.5	98.8
4	16.9	661.6	96.4
10	89.0	572.6	83.4
30	247.2	325.4	47.4
50	163.2	162.2	23.6
100	81.3	80.9	11.8
NUMBER 200	32.0	48.9	7.1

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 10.5

B. WASHING LOSS (gm.): 37.4

TOTAL PASSING NO. 200 (gm.) (A + B): 47.9

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 685.6

ERROR (Original weight - total weight of fractions)(gm.): 1.0

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .15

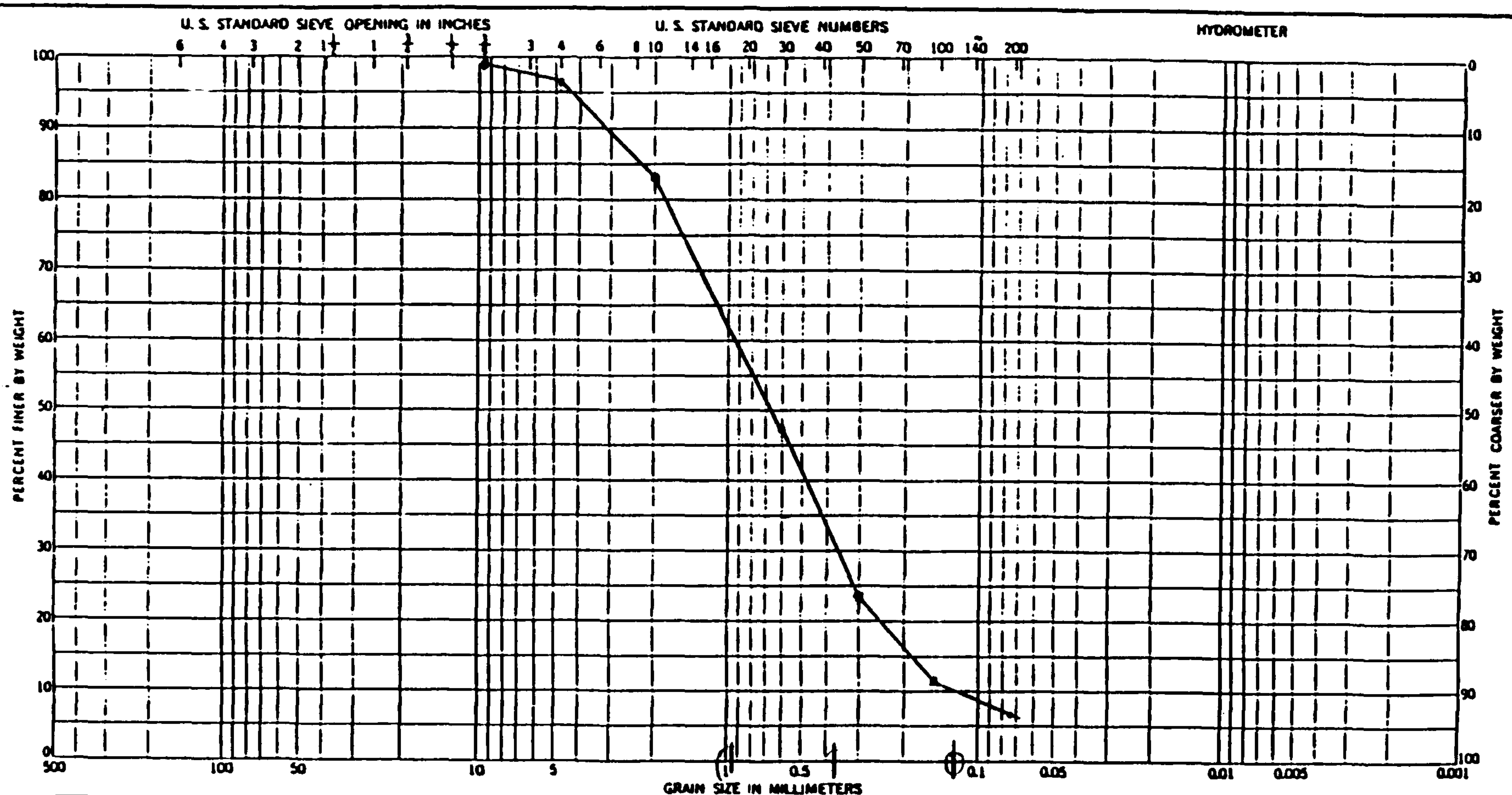
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. TNT 10 SB 25'

Date 4/2/90

GRADATION CURVES

ENG FORM 2087 D_{10} = .13 .144 1.12

Planning Surveying Engineering

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/8/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: TNT 11 SB

SAMPLE NUMBER: 25'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 933.0

WEIGHT AFTER PREWASHING (gm.): 801.7

WASHING LOSS (gm.): 131.3

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
1/2	0	933.0	100
3/8	4.2	928.8	99.6
4	8.2	920.6	98.7
10	48.0	872.6	93.5
30	322.7	549.9	58.9
50	208.6	341.3	36.6
100	130.8	210.5	22.6
NUMBER 200	55.0	155.5	16.7

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 22.6

B. WASHING LOSS (gm.): 131.3

TOTAL PASSING NO. 200 (gm.) (A. + B.): 153.9

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 931.4

ERROR (Original weight - total weight of fractions): 1.6

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .17

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/8/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: TNT 12 SB

SAMPLE NUMBER: 25

DESCRIPTION OF SAMPLE: SW - SM

PREWASHED: [X] YES [ ] NO

WEIGHT ORIGINAL SAMPLE (gm.): 735.7

WEIGHT AFTER PREWASHING (gm.): 677.0

WASHING LOSS (gm.): 58.7

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
1/2	0	735.7	100
3/8	3.6	732.1	99.5
4	7.1	725.0	98.6
10	72.3	652.7	88.7
30	228.5	424.2	57.7
50	172.5	251.7	34.2
100	117.2	134.5	18.3
NUMBER 200	53.6	80.9	11.0

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 20.7

B. WASHING LOSS (gm.): 58.7

TOTAL PASSING NO. 200 (gm.) (A. + B.): 79.4

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 734.2

ERROR (Original weight - total weight of fractions)(gm.): 1.5

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .20

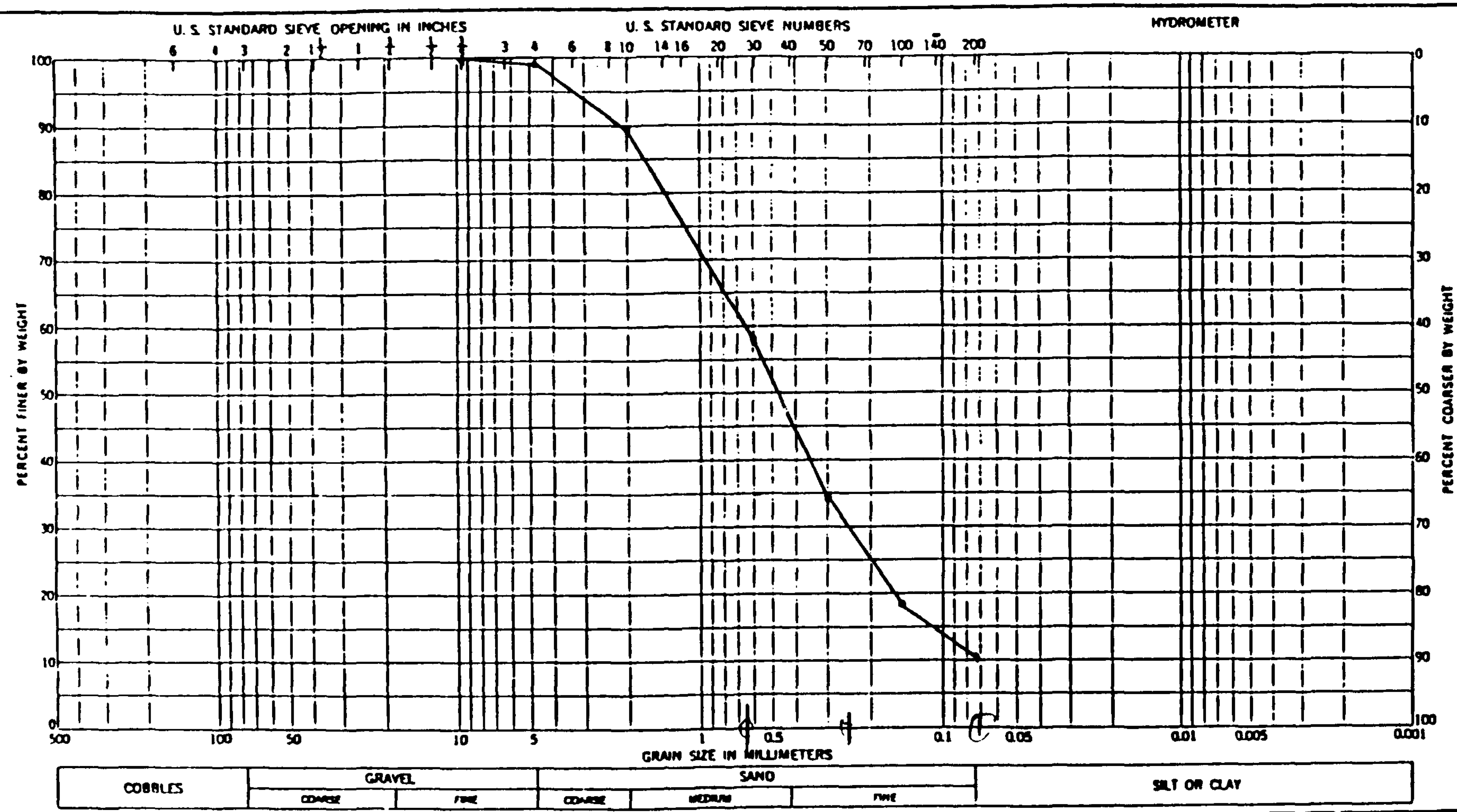
REMARKS:

SAMPLE IS NOT PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. TNT 12 SB 25'

Date 4/4/90

GRADATION CURVES

ENG FORM 1 MAY 63 2087

D_{10} = .07

D_{30} = .26 Cu 9.7 Cc $\frac{.0676}{}$ 1.5 SW SM

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/8/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: TNT 13 SB

SAMPLE NUMBER: 25

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 826.7

WEIGHT AFTER PREWASHING (gm.): 719.0

WASHING LOSS (gm.): 107.7

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
1/2	0	826.7	100
3/8	4.0	822.7	99.5
4	7.5	815.2	98.6
10	46.2	769.0	93.0
30	234.0	535.0	64.7
50	168.4	366.6	44.3
100	141.0	225.6	27.3
NUMBER 200	81.3	144.3	17.5

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 35.6

B. WASHING LOSS (gm.): 107.7

TOTAL PASSING NO. 200 (gm.) (A + B): 143.3

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 825.7

ERROR (Original weight - total weight of fractions)(gm.): 1.0

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .12

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/8/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: TNT 14 SB

SAMPLE NUMBER: 25'

DESCRIPTION OF SAMPLE: SP-SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 816.8

WEIGHT AFTER PREWASHING[1] (gm.): 790.6

WASHING LOSS[1] (gm.): 26.2

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
1/2	0	816.8	100
3/8	3.1	813.7	99.6
4	7.3	806.4	98.7
10	17.5	788.9	96.6
30	202.0	586.9	71.9
50	308.4	278.5	34.1
100	174.0	104.5	12.8
NUMBER 200	52.7	51.8	6.3

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 24.7

B. WASHING LOSS[1] (gm.): 26.2

TOTAL PASSING NO. 200 (gm.) (A. + B.): 50.9

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 815.9

ERROR (Original weight - total weight of fractions)(gm.): 0.9

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .11

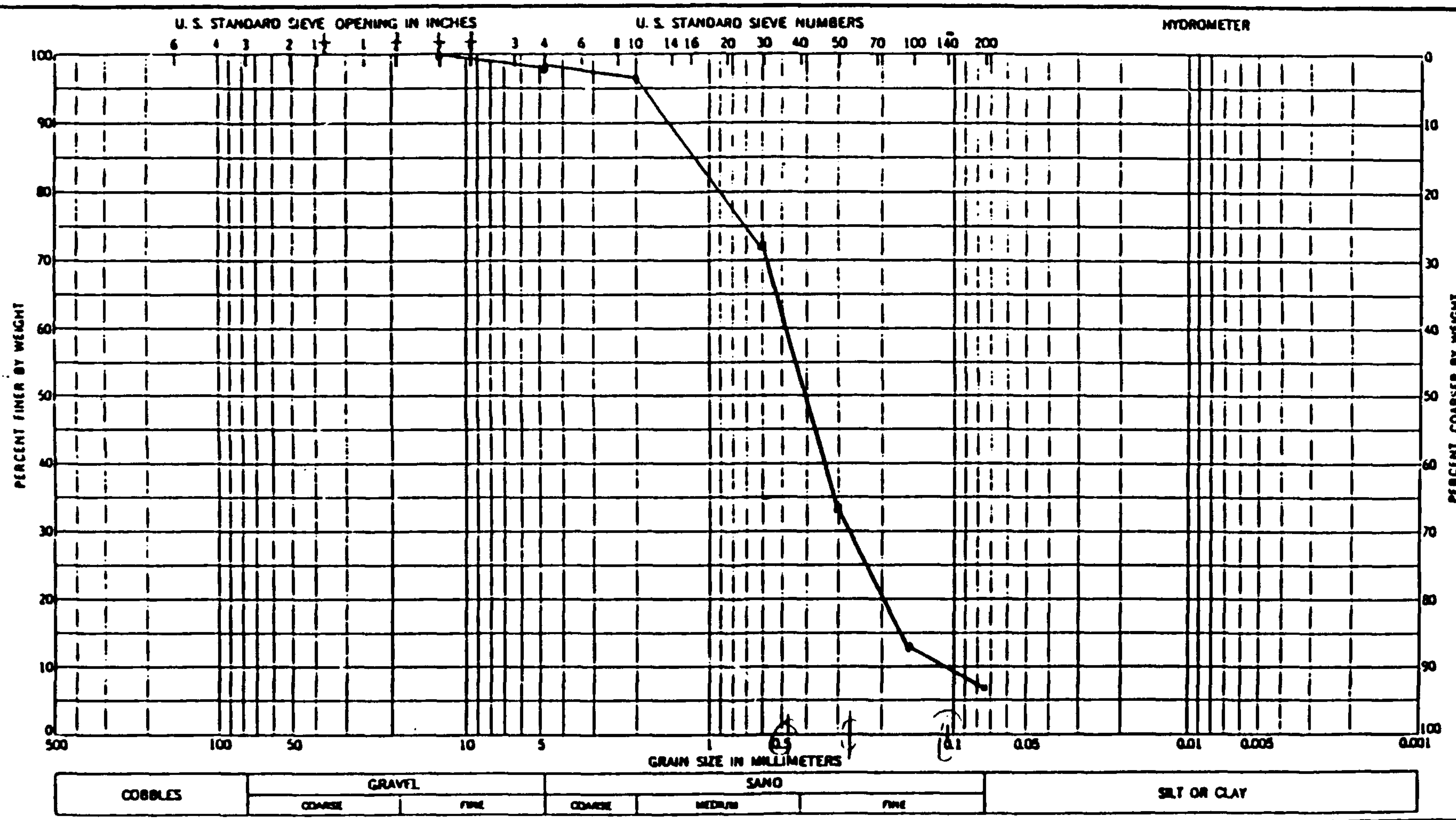
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. TNT 14 SB 25'

Date 4/9/90

GRADATION CURVES

D10 = .11

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/8/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: TNT 15 5B

SAMPLE NUMBER: 25'

DESCRIPTION OF SAMPLE: SM

PREWASHED: [X] YES [ ] NO

WEIGHT ORIGINAL SAMPLE (gm.): 704.0

WEIGHT AFTER PREWASHING[1] (gm.): 627.2

WASHING LOSS[1] (gm.): 76.8

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
1/2	0	704.0	100
3/8	6.9	697.1	99.0
4	11.0	686.1	97.5
10	44.5	641.6	91.1
30	182.6	459.0	65.2
50	177.0	282.0	40.1
100	138.4	143.6	20.4
NUMBER 200	56.5	87.1	12.4

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 9.0

B. WASHING LOSS[1] (gm.): 76.8

TOTAL PASSING NO. 200 (gm.) (A + B): 85.8

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 702.7

ERROR (Original weight - total weight of fractions)(gm.): 1.3

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$ .18

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25 A

NST Engineering Associates, Inc

Planning · Surveying · Engineering

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/8/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: TNT 16 SB

SAMPLE NUMBER: 30'

DESCRIPTION OF SAMPLE: SW - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 685.1

WEIGHT AFTER PREWASHING[1] (gm.): 641.2

WASHING LOSS[1] (gm.): 43.9

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
1/2	0	685.1	100
3/8	4.7	680.4	99.3
4	7.6	672.8	98.2
10	60.0	612.8	89.5
30	240.4	372.4	54.4
50	172.4	200.0	29.2
100	110.0	90.0	13.1
NUMBER 200	36.4	53.6	7.8

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 9.2

B. WASHING LOSS[1] (gm.): 43.9

TOTAL PASSING NO. 200 (gm.) (A. + B.): 53.1

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 684.6

ERROR (Original weight - total weight of fractions)(gm.): .5

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .07

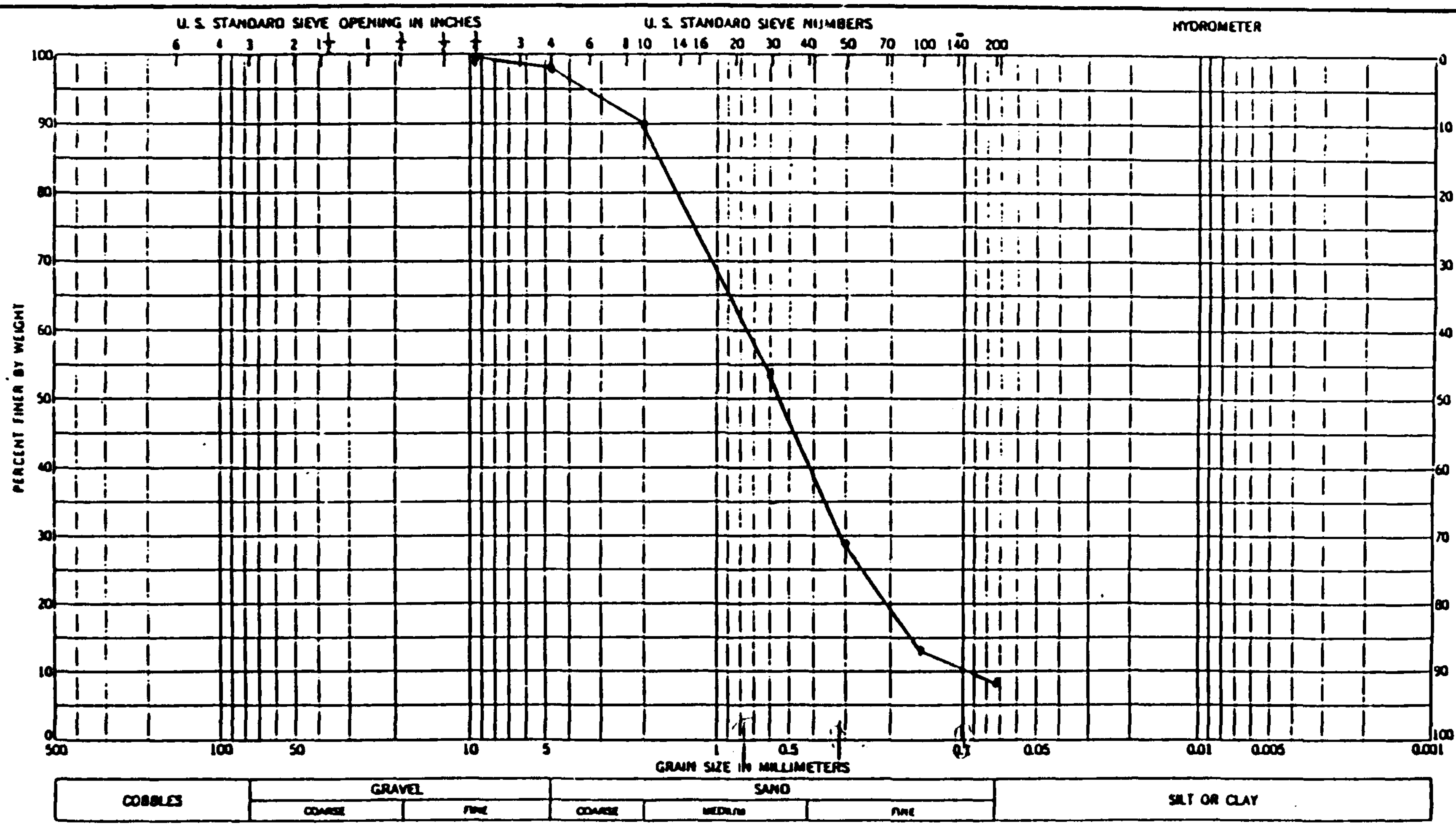
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. TNT 16 SB 30'

Date 4/10/90

GRADATION CURVES

ENG FORM 2087 D_{10} = .10 ... $\frac{}{.1024}$ = 1.3 SW-SM

Planning Surveying Engineering

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/8/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: TNT 17 SB

SAMPLE NUMBER: 35'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 754.7

WEIGHT AFTER PREWASHING[1] (gm.): 580.6

WASHING LOSS[1] (gm.): 174.1

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	754.7	100
4	1.6	753.1	99.8
10	27.1	726.0	96.2
30	145.8	580.2	76.9
50	130.2	450.0	59.6
100	145.5	304.5	40.4
NUMBER 200	102.6	201.9	26.8

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 26.3

B. WASHING LOSS[1] (gm.): 174.1

TOTAL PASSING NO. 200 (gm.) (A. + B.): 200.4

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 753.2

ERROR (Original weight - total weight of fractions)(gm.): 1.5

PERCENT ERROR: $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$ .20

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/8/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: TNT 18 SB

SAMPLE NUMBER: 30

DESCRIPTION OF SAMPLE: SW - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 946.4

WEIGHT AFTER PREWASHING (gm.): 906.8

WASHING LOSS (gm.): 39.6

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
1/2	0	946.4	100
3/8	2.1	944.3	99.8
4	5.5	938.8	99.2
10	61.4	877.4	92.7
30	408.2	469.2	49.6
50	205.4	263.8	27.9
100	134.4	129.4	13.7
NUMBER 200	67.0	62.4	6.6

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 22.0

B. WASHING LOSS (gm.): 39.6

TOTAL PASSING NO. 200 (gm.) (A + B): 61.6

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 945.6

ERROR (Original weight - total weight of fractions)(gm.): 0.8

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .08

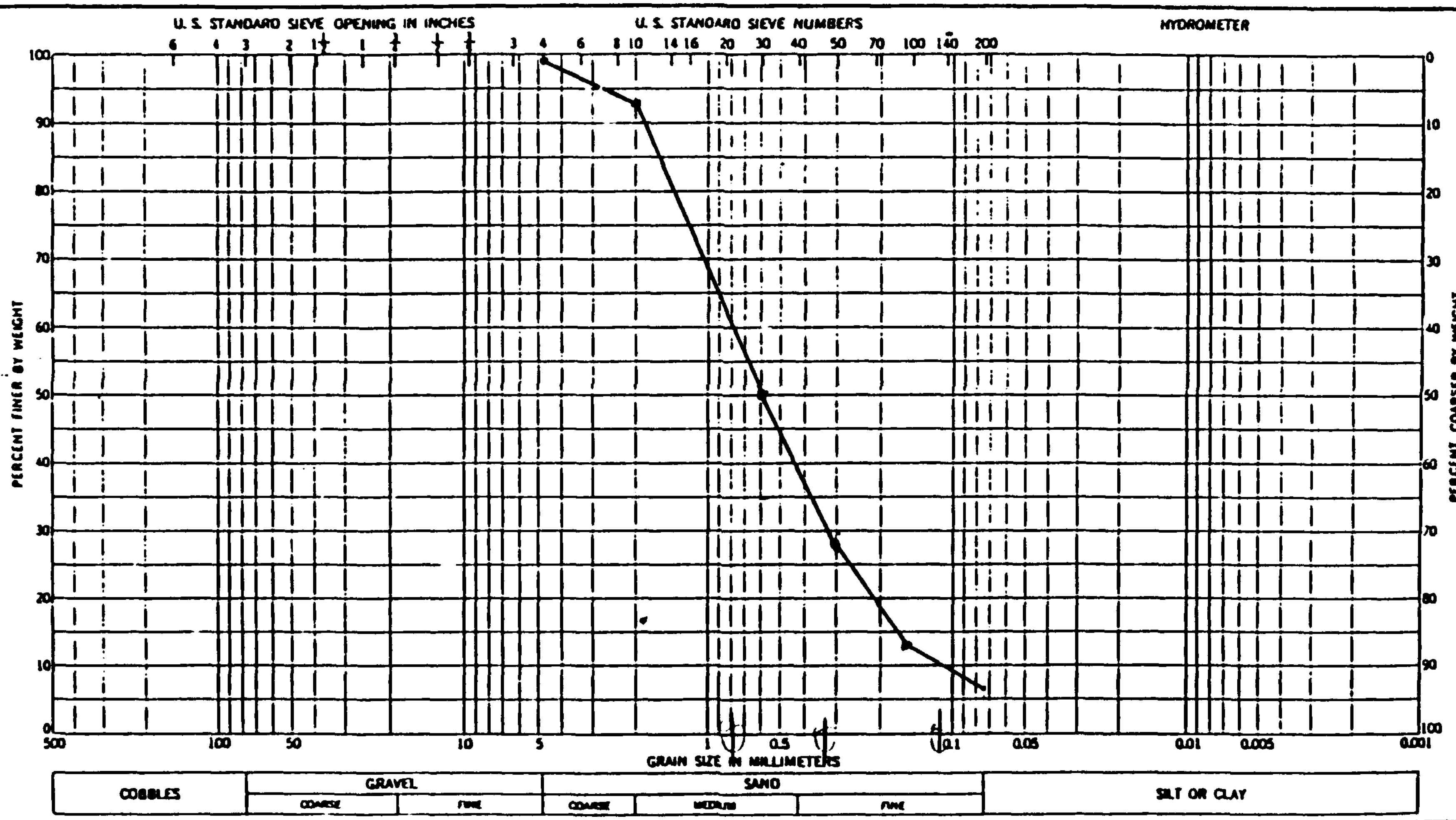
REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. TNT 18 SB 30'

Date 4/9/90

GRADATION CURVES

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 5/8/90

PROJECT: REMEDIAL INVESTIGATION
S.I.A.D. PHASE I

EXCAVATION NUMBER: TNT 19 SB

SAMPLE NUMBER: 30'

DESCRIPTION OF SAMPLE: SW - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 736.9

WEIGHT AFTER PREWASHING (gm.): 696.1

WASHING LOSS (gm.): 40.8

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	736.9	100
4	4.5	732.4	99.4
10	103.7	628.7	85.3
30	354.8	273.9	37.2
50	114.0	159.9	21.7
100	66.4	93.5	12.7
NUMBER 200	38.8	54.7	7.4

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 12.2

B. WASHING LOSS (gm.): 40.8

TOTAL PASSING NO. 200 (gm.) (A + B.): 53.0

TOTAL WEIGHT OF FRACTIONS (Total of all entries in col. b) (gm.): 735.2

ERROR (Original weight - total weight of fractions)(gm.): 1.7

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .23

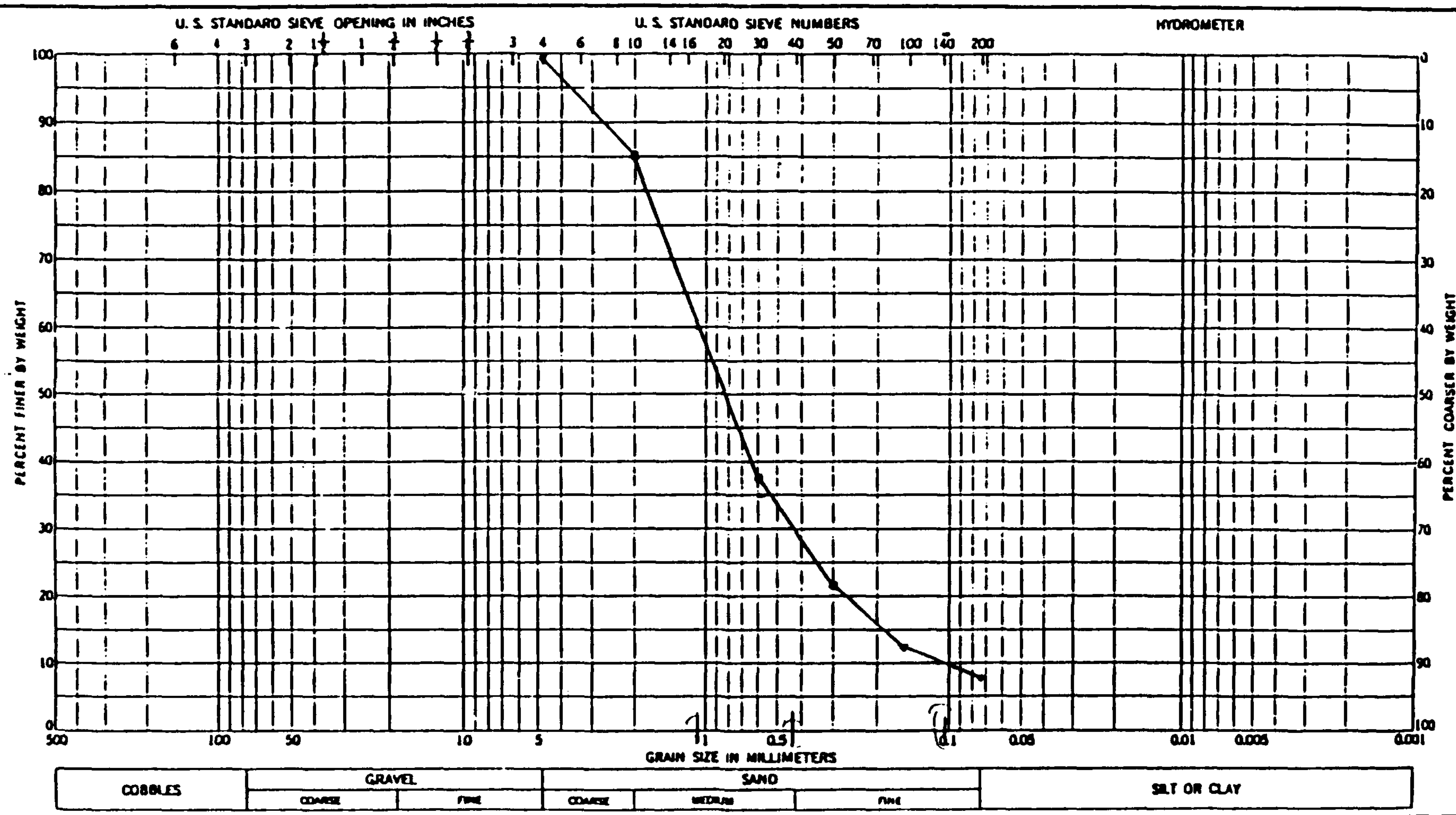
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. TNT 19 SB 30'

Date 4/9/90

GRADATION CURVES

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

Planning Surveying Engineering

SIEVE ANALYSIS DATA

DATE: 3/24/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 1

SAMPLE NUMBER: 30'-34'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 381.5

WEIGHT AFTER PREWASHING (gm.): 261.7

WASHING LOSS (gm.): 119.8

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	381.5	100
4	0.2	381.3	99.9
10	2.0	379.3	99.4
30	5.4	373.9	98.0
50	14.2	359.7	94.3
100	85.0	274.7	72.0
NUMBER 200	112.6	162.1	42.5

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 42.7

B. WASHING LOSS (gm.): 119.8

TOTAL PASSING NO. 200 (gm.) (A + B): 162.5

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 381.9

ERROR (Original weight - total weight of fractions)(gm.): .4

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .1

REMARKS:

SAMPLE IS NON-PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A

Planning · Surveying · Engineering

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 3/24/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: DSB 1

SAMPLE NUMBER: 52' - 57'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 387.5

WEIGHT AFTER PREWASHING[1] (gm.): 269.0

WASHING LOSS[1] (gm.): 118.5

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	387.5	100
4	3.1	384.4	99.2
10	13.7	370.7	95.7
30	44.0	326.7	84.3
50	49.2	277.5	71.6
100	52.1	225.4	58.2
NUMBER 200	70.8	154.6	39.9

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 35.9

B. WASHING LOSS[1] (gm.): 118.5

TOTAL PASSING NO. 200 (gm.) (A. + B.): 154.4

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 387.3

ERROR (Original weight - total weight of fractions)(gm.): .2

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .05

REMARKS:

SAMPLE IS NON-PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 3/24/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 1

SAMPLE NUMBER: 100' - 104'

DESCRIPTION OF SAMPLE: SC

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 192.1

WEIGHT AFTER PREWASHING (gm.): 152.5

WASHING LOSS (gm.): 39.6

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	———	100
4	0	192.1	100
10	27.3	164.8	85.8
30	46.6	118.2	61.5
50	27.8	90.4	47.1
100	30.8	59.6	31.0
NUMBER 200	14.5	45.1	23.5

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 5.5

B. WASHING LOSS (gm.): 39.6

TOTAL PASSING NO. 200 (gm.) (A. + B.): 45.1

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 192.1

ERROR (Original weight - total weight of fractions)(gm.): 0

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): 0

REMARKS

L.L. = 105
P.L. = 41
P.I. = 64

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A

Planning Surveying Engineering

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA		DATE 3/24/90
PROJECT REMEDIAL INVESTIGATION S.I.A.D. PHASE I	EXCAVATION NUMBER DSB 1	SAMPLE NUMBER 123'-128'
DESCRIPTION OF SAMPLE SC		PREWASHED ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.)	WEIGHT AFTER PREWASHING[1] (gm.)	WASHING LOSS[1] (gm.)
218.8	169.8	49.0

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	218.8	100
4	0.6	218.2	99.7
10	12.0	206.2	94.2
30	45.7	160.5	73.4
50	40.8	119.7	54.7
100	41.5	78.2	35.7
NUMBER 200	20.4	57.8	26.4

A. WEIGHT SIEVED THROUGH NO. 200 (gm.) 8.5	ERROR (Original weight - total weight of fractions)(gm.) .3
B. WASHING LOSS[1] (gm.) 49.0	
TOTAL PASSING NO. 200 (gm.) (A. + B.) 57.5	PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$) .13
TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.) 218.5	

REMARKS

L.L. = 114
P.L. = 44
P.I = 70

TECHNICIAN (Signature)	COMPUTED BY (Signature)	Job Number 90-25 A
Stephen H. Schmidt	Stephen H. Schmidt	

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 3/24/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: DSB 1

SAMPLE NUMBER: 174' - 179'

DESCRIPTION OF SAMPLE: SC

PREWASHED: [X] YES [ ] NO

WEIGHT ORIGINAL SAMPLE (gm.): 133.0

WEIGHT AFTER PREWASHING (gm.): 91.9

WASHING LOSS (gm.): 41.1

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
3/8	0	133.0	100
4	0.4	132.6	99.7
10	11.7	120.9	90.9
30	32.9	88.0	66.2
50	20.5	67.5	50.8
100	16.2	51.3	38.6
NUMBER 200	7.4	43.9	33.0

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 2.5

B. WASHING LOSS (gm.): 41.1

TOTAL PASSING NO. 200 (gm.) (A. + B.): 43.6

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 132.7

ERROR (Original weight - total weight of fractions)(gm.): .3

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .22

REMARKS

L.L. 108
P.L. 51
P.I. 57

TECHNICIAN (Signature): Stephen H Schmidt

COMPUTED BY (Signature): Stephen H Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

Planning Surveying Engineering

SIEVE ANALYSIS DATA

DATE: 4/6/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: OSB 1

SAMPLE NUMBER: 197'-202'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 210.3

WEIGHT AFTER PREWASHING (gm.): 125.4

WASHING LOSS (gm.): 84.9

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	—	100
4	0	210.3	100
10	8.0	202.3	96.2
30	19.4	182.9	87.0
50	16.0	166.9	79.4
100	24.4	142.5	67.8
NUMBER 200	50.2	92.3	43.9

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 7.8

B. WASHING LOSS (gm.): 84.9

TOTAL PASSING NO. 200 (gm.) (A. + B.): 92.7

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 210.7

ERROR (Original weight - total weight of fractions)(gm.): .4

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .19

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

Planning · Surveying · Engineering

SIEVE ANALYSIS DATA

DATE: 4/6/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 1

SAMPLE NUMBER: 245'-250'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 274.4

WEIGHT AFTER PREWASHING[1] (gm.): 180.1

WASHING LOSS[1] (gm.): 94.3

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	274.4	100
4	4.7	269.7	98.3
10	40.1	229.6	83.7
30	50.8	178.8	65.2
50	30.8	148.0	53.9
100	23.7	124.3	45.3
NUMBER 200	25.5	98.8	36.0

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 4.3

B. WASHING LOSS[1] (gm.): 94.3

TOTAL PASSING NO. 200 (gm.) (A. + B.): 98.6

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 274.2

ERROR (Original weight - total weight of fractions)(gm.): .2

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .07

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmidt

COMPUTED BY (Signature): Stephen H Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc

Planning · Surveying · Engineering

45 South Roop Street • Susanville, California 96130

Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/16/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: OSB-2

SAMPLE NUMBER: 51'-56'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 550.0

WEIGHT AFTER PREWASHING (gm.): 469.1

WASHING LOSS (gm.): 80.9

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE: WEIGHT (gm.) c	PASSING SIEVE: PERCENT d
3/8	0	550.0	100
4	0.7	549.3	99.9
10	0.7	548.6	99.7
30	45.6	503.0	91.5
50	183.0	320.0	58.2
100	149.0	171.0	31.1
NUMBER 200	75.7	95.3	17.3

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 14.2

B. WASHING LOSS (gm.): 80.9

TOTAL PASSING NO. 200 (gm.) (A + B): 95.1

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 549.8

ERROR (Original weight - total weight of fractions)(gm.): .2

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .04

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmidt

COMPUTED BY (Signature): Stephen H Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc

Planning Surveying Engineering

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA			DATE 4/6/90
PROJECT REMEDIAL INVESTIGATION S.I.A.D. PHASE I		EXCAVATION NUMBER DSB 2	SAMPLE NUMBER 79' - 84'
DESCRIPTION OF SAMPLE SM			PREWASHED ☒ YES ☐ NO
WEIGHT ORIGINAL SAMPLE (gm.) 504.7	WEIGHT AFTER PREWASHING (gm.) 449.2		WASHING LOSS (gm.) 55.5

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	—	100
4	0	504.7	100
10	0.6	504.1	99.9
30	32.5	471.6	93.4
50	109.7	361.9	71.7
100	201.0	160.9	31.9
NUMBER 200	94.9	66.0	13.1

A. WEIGHT SIEVED THROUGH NO. 200 (gm.) 10.2	ERROR (Original weight - total weight of fractions)(gm.) .3
B. WASHING LOSS (gm.) 55.5	
TOTAL PASSING NO. 200 (gm.) (A. + B.) 65.7	PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}}$ x 100) .06
TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.) 504.4	

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature)	COMPUTED BY (Signature)	Job Number 90-25 A
Stephen H Schmidt	Stephen H Schmidt	

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/6/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 2

SAMPLE NUMBER: 101.5-103.5

DESCRIPTION OF SAMPLE: SP - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 373.3

WEIGHT AFTER PREWASHING (gm.): 349.8

WASHING LOSS (gm.): 23.5

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	373.3	100
4	3.5	369.8	99.1
10	2.0	367.8	98.5
30	105.7	262.1	70.2
50	148.0	114.1	30.6
100	64.1	50.0	13.4
NUMBER 200	23.8	26.2	7.0

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 2.8

B. WASHING LOSS (gm.): 23.5

TOTAL PASSING NO. 200 (gm.) (A. + B.): 26.3

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 373.4

ERROR (Original weight - total weight of fractions)(gm.): .1

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .03

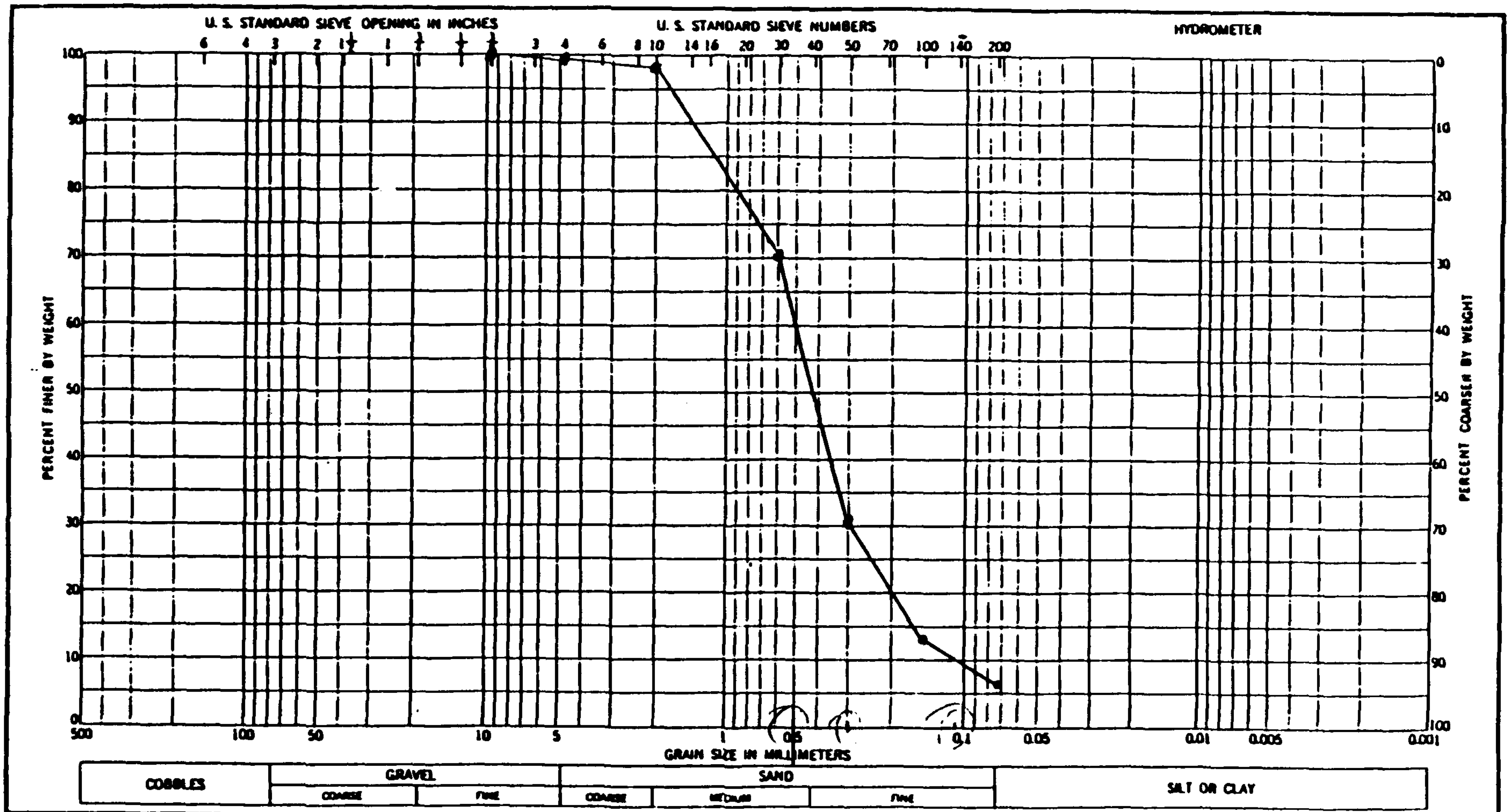
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project SIAD

Area

Boring No. DSB 2 101.5 - 10?.5

Date 3/7/90

GRADATION CURVES

ENG FORM 1 MAY 63 2087 D_{10} .11 $D_{??}$.?8 C_u 4.5 = SP - SM

NST Engineering Associates, Inc

Planning · Surveying · Engineering

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/6/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 2

SAMPLE NUMBER: 126'-129'

DESCRIPTION OF SAMPLE: SP-SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 514.5

WEIGHT AFTER PREWASHING (gm.): 488.3

WASHING LOSS (gm.): 26.2

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	—	100
4	0	514.5	100
10	1.5	513.0	99.7
30	79.8	433.2	84.2
50	221.2	212.0	41.2
100	145.2	66.8	13.0
NUMBER 200	34.0	32.8	6.4

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 6.5

B. WASHING LOSS (gm.): 26.2

TOTAL PASSING NO. 200 (gm.) (A. + B.): 32.7

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 514.4

ERROR (Original weight - total weight of fractions)(gm.): .1

PERCENT ERROR: $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$ .02

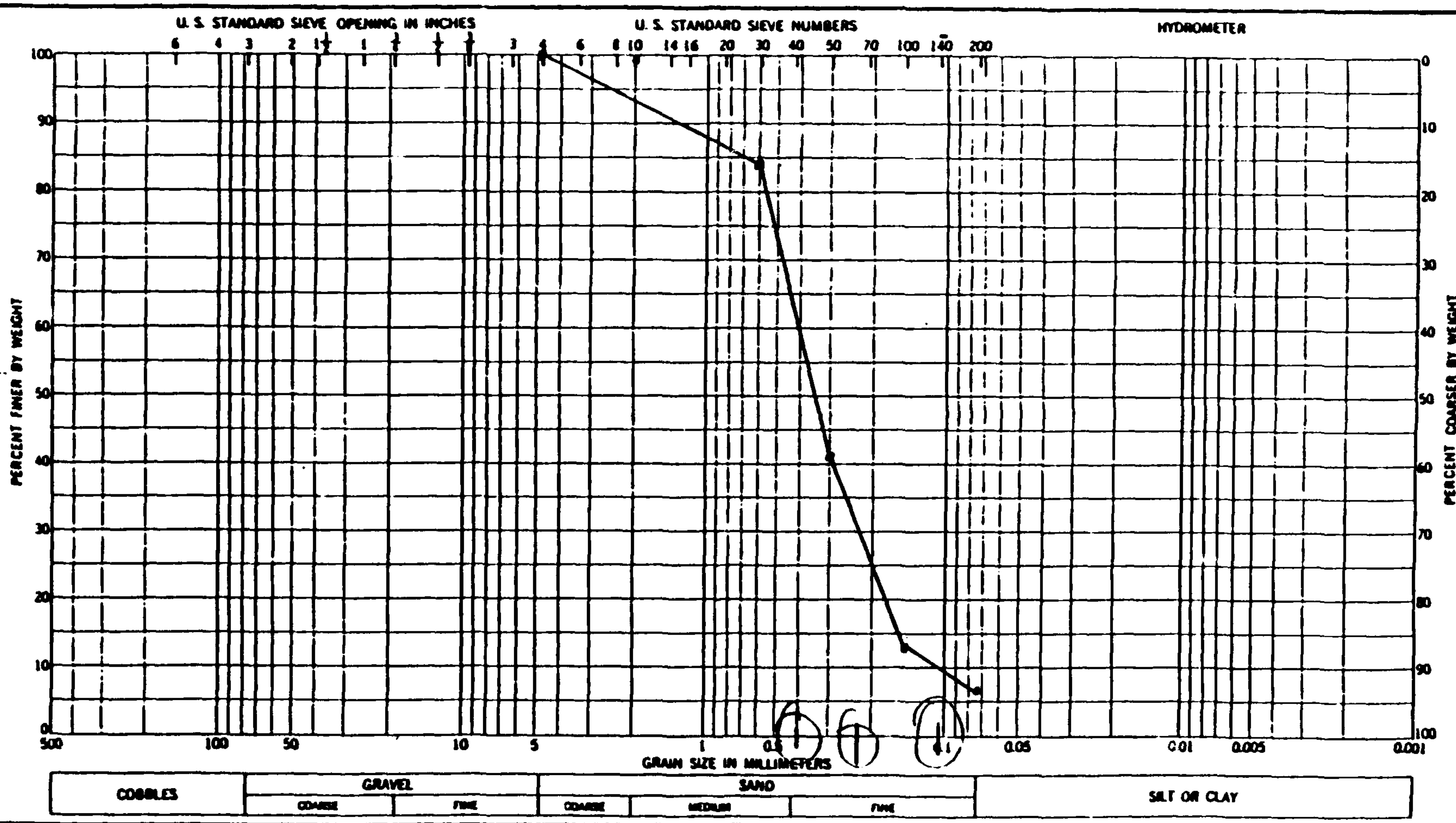
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project SIAD

Area

Boring No. DSB 2 126'-129'

Date 3/12/90

GRADATION CURVES

ENG FORM 1 MAY 63 2087

D_{10} .11
D_{60} .4

C_u 3.6 = SP-SM

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/6/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: DSB 2

SAMPLE NUMBER: 150' - 152'

DESCRIPTION OF SAMPLE: SM

PREWASHED: [X] YES [ ] NO

WEIGHT ORIGINAL SAMPLE (gm.): 336.1

WEIGHT AFTER PREWASHING (gm.): 295.7

WASHING LOSS (gm.): 40.4

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	336.1	100
4	0.8	335.3	99.8
10	3.3	332.0	98.8
30	44.6	287.4	85.5
50	116.2	171.2	50.9
100	93.0	78.2	23.3
NUMBER 200	33.1	45.1	13.4

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 4.5

B. WASHING LOSS (gm.): 40.4

TOTAL PASSING NO. 200 (gm.) (A. + B.): 44.9

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 335.9

ERROR (Original weight - total weight of fractions)(gm.): .2

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .06

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmidt

COMPUTED BY (Signature): Stephen H Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/6/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB-2

SAMPLE NUMBER: 211-216

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 276.2

WEIGHT AFTER PREWASHING (gm.): 197.3

WASHING LOSS (gm.): 78.9

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	276.2	100
4	0.5	275.7	99.8
10	1.9	273.8	99.1
30	30.4	243.4	88.1
50	62.8	180.6	65.4
100	75.1	105.1	38.1
NUMBER 200	20.3	85.2	30.8

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 6.1

B. WASHING LOSS (gm.): 78.9

TOTAL PASSING NO. 200 (gm.) (A. + B.): 85.0

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 276.0

ERROR (Original weight - total weight of fractions)(gm.): .2

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .07

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A

Planning Surveying Engineering

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA		DATE 4/6/90
PROJECT S.I.A.D. REMEDIAL INVESTIGATION PHASE I	EXCAVATION NUMBER OSB 2	SAMPLE NUMBER 226' - 231'
DESCRIPTION OF SAMPLE SM		PREWASHED ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.)	WEIGHT AFTER PREWASHING[1] (gm.)	WASHING LOSS[2] (gm.)
332.7	263.9	68.8

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	—	100
4	0	332.7	100
10	1.1	331.6	99.7
30	35.9	295.7	88.8
50	66.2	229.5	69.0
100	107.3	122.2	36.7
NUMBER 200	45.5	76.7	23.1

A. WEIGHT SIEVED THROUGH NO. 200 (gm.) 7.6	ERROR (Original weight - total weight of fractions)(gm.) .3
B. WASHING LOSS[2] (gm.) 68.8	
TOTAL PASSING NO. 200 (gm.) (A. + B.) 76.4	PERCENT ERROR (Error (gm.) / Original weight (gm.) x 100) .09
TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.) 332.4	

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature)	COMPUTED BY (Signature)	Job Number 90-25 A
[signature]	[signature]	

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/6/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 2

SAMPLE NUMBER: 246' - 250'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 225.9

WEIGHT AFTER PREWASHING (gm.): 172.8

WASHING LOSS (gm.): 53.1

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	—	100
4	0	225.9	100
10	3.4	222.5	98.5
30	37.1	185.4	82.1
50	49.7	135.7	60.1
100	58.8	76.9	34.0
NUMBER 200	20.9	56.0	24.8

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 3.2

B. WASHING LOSS (gm.): 53.1

TOTAL PASSING NO. 200 (gm.) (A. + B.): 56.3

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 226.2

ERROR (Original weight - total weight of fractions)(gm.): .3

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .13

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/5/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: DSB 3

SAMPLE NUMBER: 125⁵ - 128⁸

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 149.9

WEIGHT AFTER PREWASHING (gm.): 92.8

WASHING LOSS (gm.): 57.1

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	———	100
4	0	149.9	100
10	5.6	144.3	96.3
30	18.4	125.9	84.0
50	20.0	105.9	70.6
100	21.0	84.9	56.6
NUMBER 200	22.7	62.2	41.5

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 5.3

B. WASHING LOSS (gm.): 57.1

TOTAL PASSING NO. 200 (gm.) (A. + B.): 62.4

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 150.1

ERROR (Original weight - total weight of fractions)(gm.): .20

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .1

REMARKS:

L.L. = 62
P.L. = 59
P.I = 3

TECHNICIAN (Signature): Stephen H. Schmitt

COMPUTED BY (Signature): Stephen H. Schmitt

Job Number 90-25 A

NST Engineering Associates, Inc
Planning · Surveying · Engineering
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/5/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 3

SAMPLE NUMBER: 150 - 152

DESCRIPTION OF SAMPLE: M H

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 152.8

WEIGHT AFTER PREWASHING (gm.): 72.0

WASHING LOSS (gm.): 80.8

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	—	100
4	0	152.8	100
10	7.6	145.2	95.0
30	14.8	130.4	85.3
50	11.4	119.0	77.9
100	17.7	101.3	66.3
NUMBER 200	18.7	82.6	54.1

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 1.7

B. WASHING LOSS (gm.): 80.8

TOTAL PASSING NO. 200 (gm.) (A. + B.): 82.5

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 152.7

ERROR (Original weight - total weight of fractions)(gm.): .1

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .07

REMARKS

L.L. = 68
P.L. = 36
P.I. = 32

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A

Planning Surveying Engineering

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/5/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: DSB 3

SAMPLE NUMBER: 208' - 212'

DESCRIPTION OF SAMPLE: S M

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 104.7

WEIGHT AFTER PREWASHING (gm.): 75.4

WASHING LOSS (gm.): 29.3

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	—	100
4	0	104.7	100
10	6.7	98.0	93.6
30	20.0	78.0	74.5
50	14.7	63.3	60.5
100	12.2	51.1	48.8
NUMBER 200	14.3	36.8	35.1

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 7.3

B. WASHING LOSS (gm.): 29.3

TOTAL PASSING NO. 200 (gm.) (A + B): 36.6

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 104.5

ERROR (Original weight - total weight of fractions) (gm.): .2

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$) = .2

REMARKS

L.L. = 76
P.L. = 48
P.I. = 28

TECHNICIAN (Signature): Stephen H. Schmitt

COMPUTED BY (Signature): Stephen H. Schmitt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/5/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 3

SAMPLE NUMBER: 228'-230'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.)	WEIGHT AFTER PREWASHING[1] (gm.)	WASHING LOSS[1] (gm.)
101.4	67.2	34.2

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	—	100
4	0	101.4	100
10	0.9	100.5	99.1
30	17.3	83.2	82.1
50	17.4	65.8	64.9
100	11.5	54.3	53.6
NUMBER 200	13.0	41.3	40.7

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 6.9

B. WASHING LOSS[1] (gm.): 34.2

TOTAL PASSING NO. 200 (gm.) (A. + B.): 41.1

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 101.2

ERROR (Original weight - total weight of fractions)(gm.): .2

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .2

REMARKS:

L.L. = 79
P.L. = 49
P.I = 30

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA			DATE 4/5/90
PROJECT S.I.A.D. REMEDIAL INVESTIGATION PHASE I		EXCAVATION NUMBER DSB 3	SAMPLE NUMBER 247'-251'
DESCRIPTION OF SAMPLE MH			PREWASHED ☒ YES ☐ NO
WEIGHT ORIGINAL SAMPLE (gm.) 228.4	WEIGHT AFTER PREWASHING (gm.) 123.3	WASHING LOSS (gm.) 105.1	

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	—	100
4	0	228.4	100
10	10.1	218.3	95.6
30	41.2	177.1	77.5
50	28.3	148.8	65.2
100	18.2	130.6	57.2
NUMBER 200	13.7	116.9	51.2

A. WEIGHT SIEVED THROUGH NO. 200 (gm.) 11.9	ERROR (Original weight - total weight of fractions)(gm.) .1
B. WASHING LOSS (gm.) 105.1	
TOTAL PASSING NO. 200 (gm.) (A. + B.) 117.0	PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$) .04
TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.) 228.5	

REMARKS

L.L. = 99
P.L. = 56
P.I = 43

TECHNICIAN (Signature)	COMPUTED BY (Signature)	Job Number 90-25 A
Stephen H. Schmitt	Stephen H. Schmitt	

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/7/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 4

SAMPLE NUMBER: 26.5 - 31.5

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 331.8

WEIGHT AFTER PREWASHING (gm.): 250.0

WASHING LOSS (gm.): 81.8

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	331.8	100
4	1.1	330.7	99.7
10	7.1	323.6	97.5
30	58.9	264.7	79.8
50	82.0	182.7	55.1
100	64.8	117.9	35.5
NUMBER 200	32.5	85.4	25.7

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 3.5

B. WASHING LOSS (gm.): 81.8

TOTAL PASSING NO. 200 (gm.) (A. + B.): 85.3

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 331.7

ERROR (Original weight - total weight of fractions)(gm.): .1

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .03

REMARKS:

SAMPLE IS NON - PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/7/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: OSB 4

SAMPLE NUMBER: 50 - 55

DESCRIPTION OF SAMPLE: SM

PREWASHED: [X] YES [ ] NO

WEIGHT ORIGINAL SAMPLE (gm.): 526.6

WEIGHT AFTER PREWASHING (gm.): 448.8

WASHING LOSS (gm.): 77.8

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	—	100
4	0	526.6	100
10	3.0	523.6	99.4
30	103.6	420.0	79.8
50	146.8	273.2	51.9
100	122.7	150.5	28.6
NUMBER 200	61.6	89.5	17.0

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 10.0

B. WASHING LOSS (gm.): 77.8

TOTAL PASSING NO. 200 (gm.) (A + B): 87.8

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 525.5

ERROR (Original weight - total weight of fractions)(gm.): 1.1

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .21

REMARKS:

SAMPLE IS NON - PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

Planning Surveying Engineering

SIEVE ANALYSIS DATA

DATE: 4/7/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 4

SAMPLE NUMBER: 76'-80'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 421.4

WEIGHT AFTER PREWASHING[1] (gm.): 367.3

WASHING LOSS[1] (gm.): 54.1

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	——	100
4	0	421.4	100
10	3.6	417.8	99.2
30	69.1	348.7	82.8
50	110.2	238.5	56.6
100	135.3	103.2	24.5
NUMBER 200	43.6	59.6	14.1

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 5.4

B. WASHING LOSS[1] (gm.): 54.1

TOTAL PASSING NO. 200 (gm.) (A. + B.): 59.5

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 421.3

ERROR (Original weight - total weight of fractions)(gm.): .1

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .02

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

Planning Surveying Engineering

SIEVE ANALYSIS DATA

DATE: 4/7/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: DSC 4

SAMPLE NUMBER: 102' -103.5'

DESCRIPTION OF SAMPLE: SP - SM

PREWASHED: [X] YES [ ] NO

WEIGHT ORIGINAL SAMPLE (gm.): 335.6

WEIGHT AFTER PREWASHING (gm.): 315.8

WASHING LOSS (gm.): 19.8

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	—	100
4	0	335.6	100
10	0.7	334.9	99.8
30	14.5	320.4	95.5
50	94.5	225.9	67.3
100	169.5	56.4	16.8
NUMBER 200	33.4	23.0	6.9

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 3.5

B. WASHING LOSS (gm.): 19.8

TOTAL PASSING NO. 200 (gm.) (A + B): 23.3

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 335.7

ERROR (Original weight - total weight of fractions)(gm.): .3

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .09

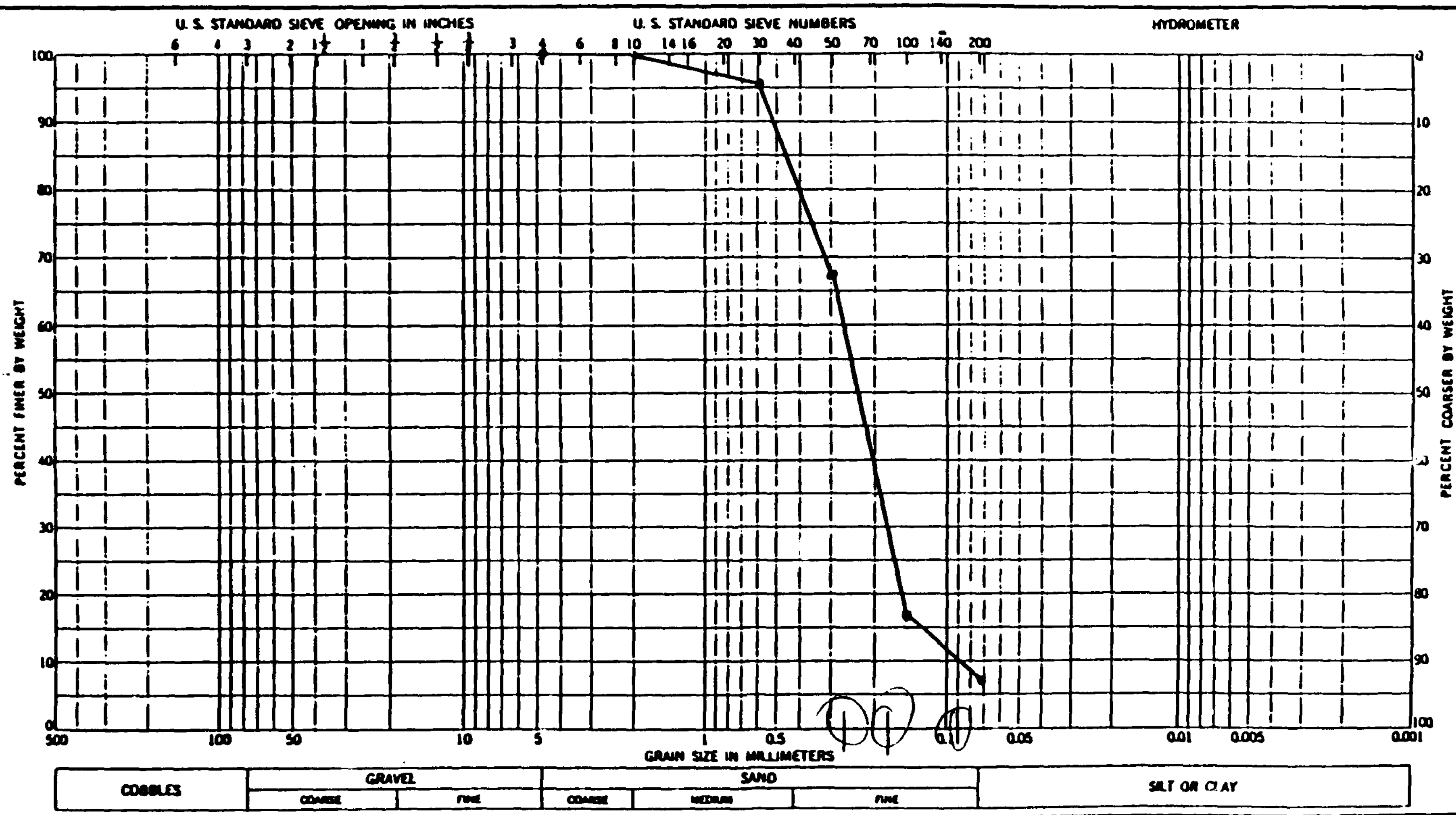
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project SIAD

Area

Boring No. DSB 4 102' - 103.5

Date 2/15/90

GRADATION CURVES

ENG FORM 1 MAY 63 2087

D_{10} .09
D_{30} .18
D_{60} .27

$C_u = 3$

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/7/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: DSB 4

SAMPLE NUMBER: 126' - 127'

DESCRIPTION OF SAMPLE: SW - SM

PREWASHED: YES [X] NO [ ]

WEIGHT ORIGINAL SAMPLE (gm.): 370.8

WEIGHT AFTER PREWASHING (gm.): 352.6

WASHING LOSS (gm.): 18.2

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	370.8	100
4	1.8	369.0	99.5
10	16.3	352.7	95.1
30	241.5	111.2	30.0
50	54.3	56.9	15.4
100	23.9	33.0	8.9
NUMBER 200	12.6	20.4	5.5

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 2.1

B. WASHING LOSS (gm.): 18.2

TOTAL PASSING NO. 200 (gm.) (A. + B.): 20.3

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 370.7

ERROR (Original weight - total weight of fractions)(gm.): .1

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .03

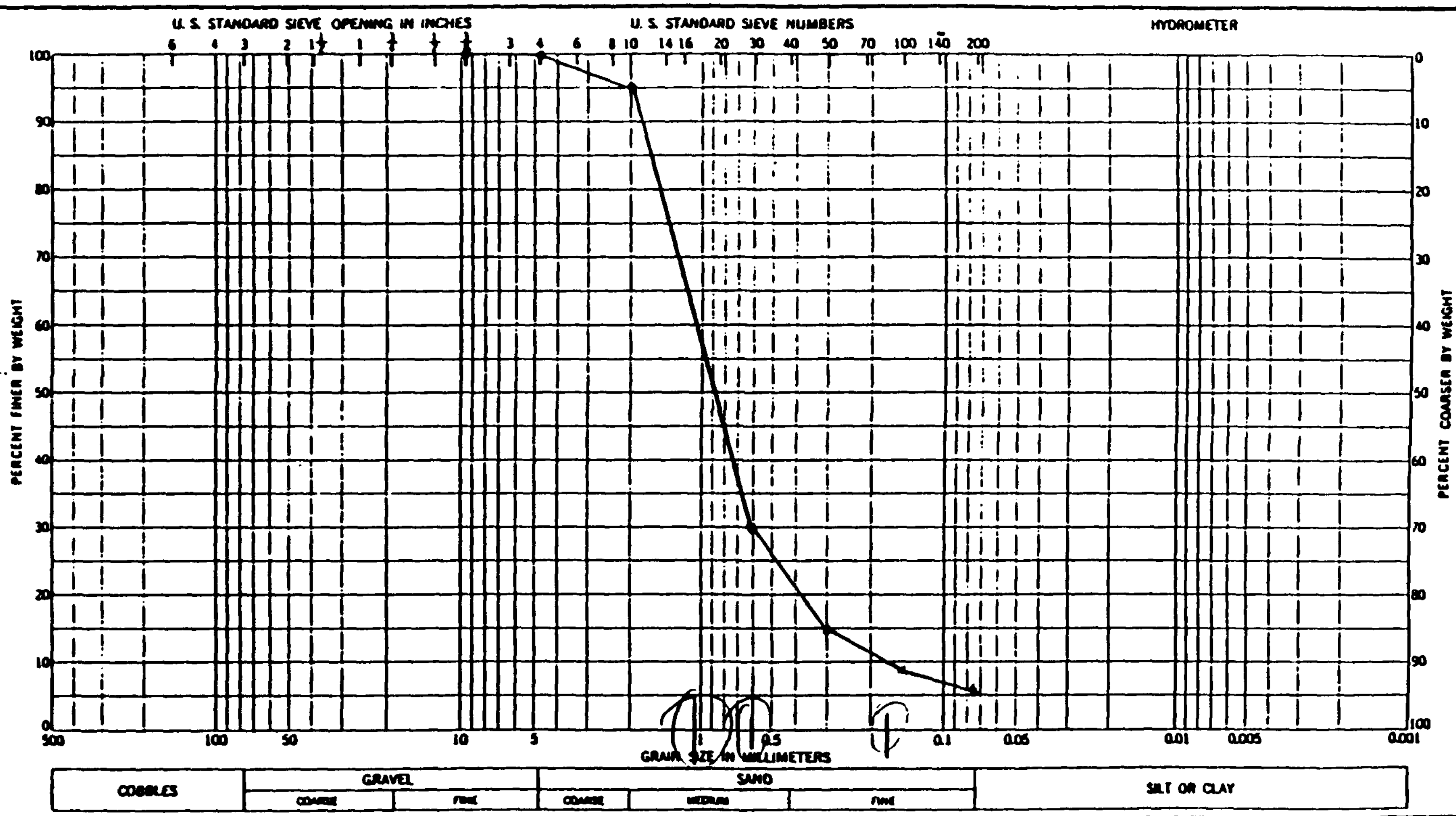
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmidt

COMPUTED BY (Signature): Stephen H Schmidt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DSD 4 126-127

Date 3/15/90

GRADATION CURVES

ENG FORM 1 MAY 63 2087

D_{10} = .18 D_{60} = 1.0 Cu 6.1 Cc = 1.8 = SW SM

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/7/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: DSB 4

SAMPLE NUMBER: 149⁵-153

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.)	WEIGHT AFTER PREWASHING (gm.)	WASHING LOSS (gm.)
388.7	289.2	99.5

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	—	100
4	0	388.7	100
10	1.0	387.7	99.7
30	13.3	374.4	96.3
50	31.0	343.4	88.4
100	92.3	251.1	64.6
NUMBER 200	126.8	124.3	32.0

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 24.0

B. WASHING LOSS (gm.): 99.5

TOTAL PASSING NO. 200 (gm.) (A. + B.): 123.5

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 387.9

ERROR (Original weight - total weight of fractions)(gm.): 0.8

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .21

REMARKS:

SAMPLE IS NON-PLASTIC

TECHNICIAN (Signature)	COMPUTED BY (Signature)	Job Number
Stephen H. Schmitt	Stephen H. Schmitt	90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/7/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: DSB 4

SAMPLE NUMBER: 173' -176'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 282.0

WEIGHT AFTER PREWASHING[1] (gm.): 231.5

WASHING LOSS[1] (gm.): 50.5

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	—	100
4	0	282.0	100
10	2.8	279.2	99.0
30	35.6	243.6	86.4
50	82.2	161.4	57.2
100	67.0	94.4	33.5
NUMBER 200	38.2	56.2	19.9

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 5.5

B. WASHING LOSS[1] (gm.): 50.5

TOTAL PASSING NO. 200 (gm.) (A. + B.): 56.0

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 281.8

ERROR (Original weight - total weight of fractions)(gm.): .2

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .07

REMARKS: SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmitt

COMPUTED BY (Signature): Stephen H. Schmitt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/7/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 4

SAMPLE NUMBER: 198'-20'

DESCRIPTION OF SAMPLE: SC

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 351.4

WEIGHT AFTER PREWASHING (gm.): 282.6

WASHING LOSS (gm.): 68.8

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	351.4	100
4	0.6	350.8	99.8
10	9.2	341.6	97.2
30	87.9	253.7	72.2
50	86.8	166.9	47.5
100	61.5	105.4	30.0
NUMBER 200	30.7	74.7	21.3

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 5.7

B. WASHING LOSS (gm.): 68.8

TOTAL PASSING NO. 200 (gm.) (A. + B.): 74.5

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 351.2

ERROR (Original weight - total weight of fractions)(gm.): .2

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .06

REMARKS

L.L. = 30
P.L. = 23
P.I. = 7

TECHNICIAN (Signature): Stephen H. Schmitt

COMPUTED BY (Signature): Stephen H. Schmitt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/7/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 4

SAMPLE NUMBER: 224 - 226

DESCRIPTION OF SAMPLE: SP - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 540.3

WEIGHT AFTER PREWASHING (gm.): 500.0

WASHING LOSS (gm.): 40.3

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	—	100
4	0	540.3	100
10	2.7	537.6	99.5
30	78.4	459.2	85.0
50	117.5	341.7	63.2
100	181.8	159.9	29.6
NUMBER 200	108.0	51.9	9.6

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 10.9

B. WASHING LOSS (gm.): 40.3

TOTAL PASSING NO. 200 (gm.) (A. + B.): 51.2

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 539.6

ERROR (Original weight - total weight of fractions)(gm.): 0.7

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$ .13

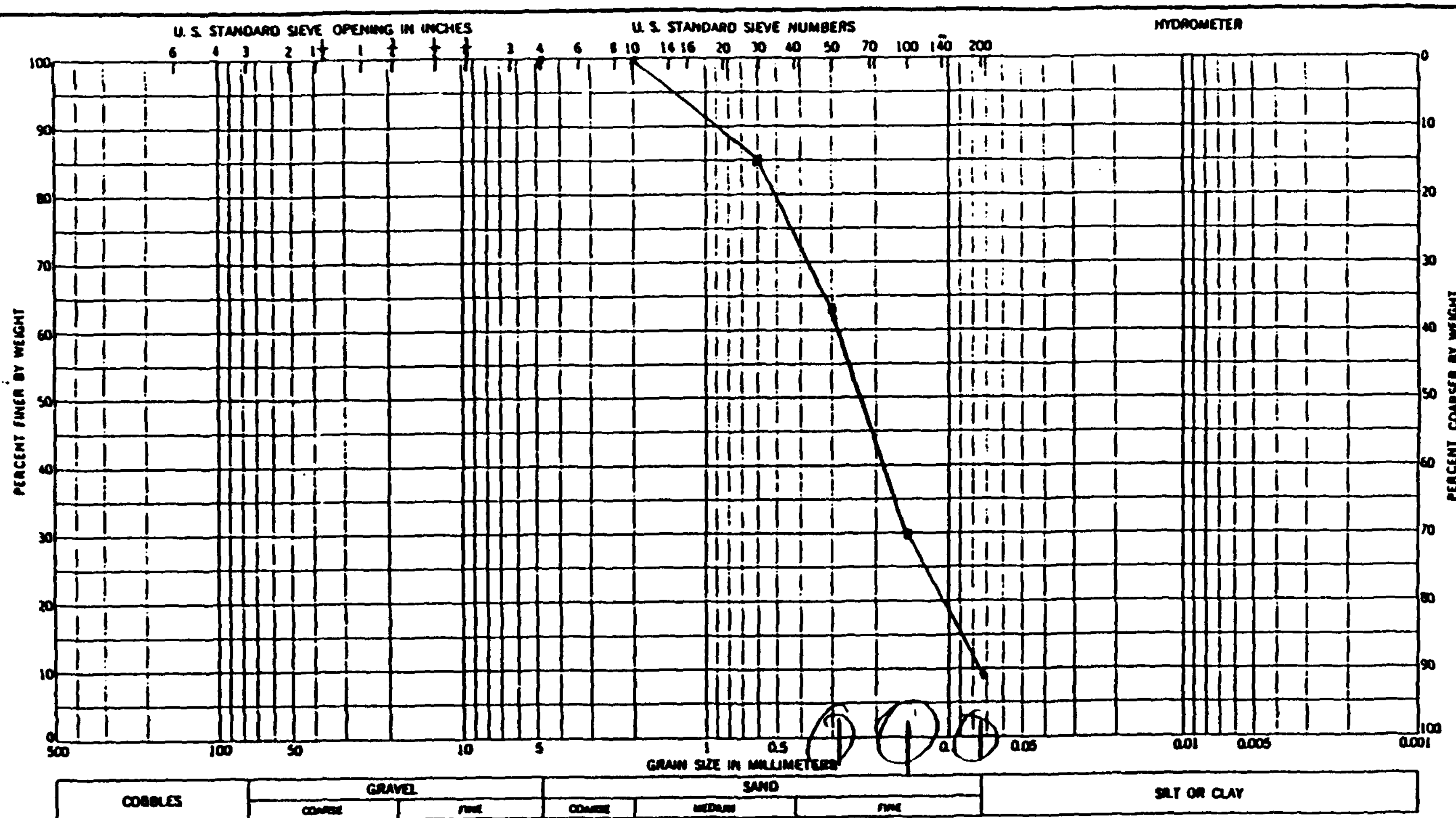
REMARKS:

SAMPLE IS NON - PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DSB 4 224^{0} – 226^{5}

Date 3/16/90

GRADATION CURVES

ENG FORM 1 MAY 63 2087

D_{10} .075

D_{30} .16 $C_u = 3.9$

D_{60} .29

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/7/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: DSB 4

SAMPLE NUMBER: 246.0 - 247.3

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.)	WEIGHT AFTER PREWASHING (gm.)	WASHING LOSS (gm.)
238.3	198.7	39.6

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	238.3	100
4	1.2	237.1	99.5
10	8.0	229.1	96.1
30	52.8	176.3	74.0
50	55.6	120.7	50.7
100	54.1	66.6	28.0
NUMBER 200	23.9	42.7	17.9

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 3.0

B. WASHING LOSS (gm.): 39.6

TOTAL PASSING NO. 200 (gm.) (A + B): 42.6

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 238.2

ERROR (Original weight - total weight of fractions)(gm.): .1

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .04

REMARKS:

SAMPLE IS NON-PLASTIC

TECHNICIAN (Signature): Stephen H Schmidt

COMPUTED BY (Signature): Stephen H Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc

Planning • Surveying • Engineering

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/16/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 5

SAMPLE NUMBER: 35⁷ - 39⁵

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 167.4

WEIGHT AFTER PREWASHING (gm.): 129.9

WASHING LOSS (gm.): 37.5

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	——	100
4	0	167.4	100
10	1.1	166.3	99.3
30	1.4	164.9	98.5
50	5.0	159.9	95.5
100	59.2	100.7	60.2
NUMBER 200	57.4	43.3	25.9

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 6.0

B. WASHING LOSS (gm.): 37.5

TOTAL PASSING NO. 200 (gm.) (A + B): 43.5

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 167.6

ERROR (Original weight - total weight of fractions)(gm.): .2

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .12

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/16/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 5

SAMPLE NUMBER: 48' - 53'

DESCRIPTION OF SAMPLE: SP - SM

PREWASHED: [X] YES [ ] NO

WEIGHT ORIGINAL SAMPLE (gm.): 250.2

WEIGHT AFTER PREWASHING (gm.): 236.5

WASHING LOSS (gm.): 13.7

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	—	100
4	0	250.2	100
10	2.0	248.2	99.2
30	23.4	224.8	89.9
50	61.0	163.8	65.5
100	136.0	27.8	11.1
NUMBER 200	12.0	15.8	6.3

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 2.0

B. WASHING LOSS (gm.): 13.7

TOTAL PASSING NO. 200 (gm.) (A + B): 15.7

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 250.1

ERROR (Original weight - total weight of fractions)(gm.): .1

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .04

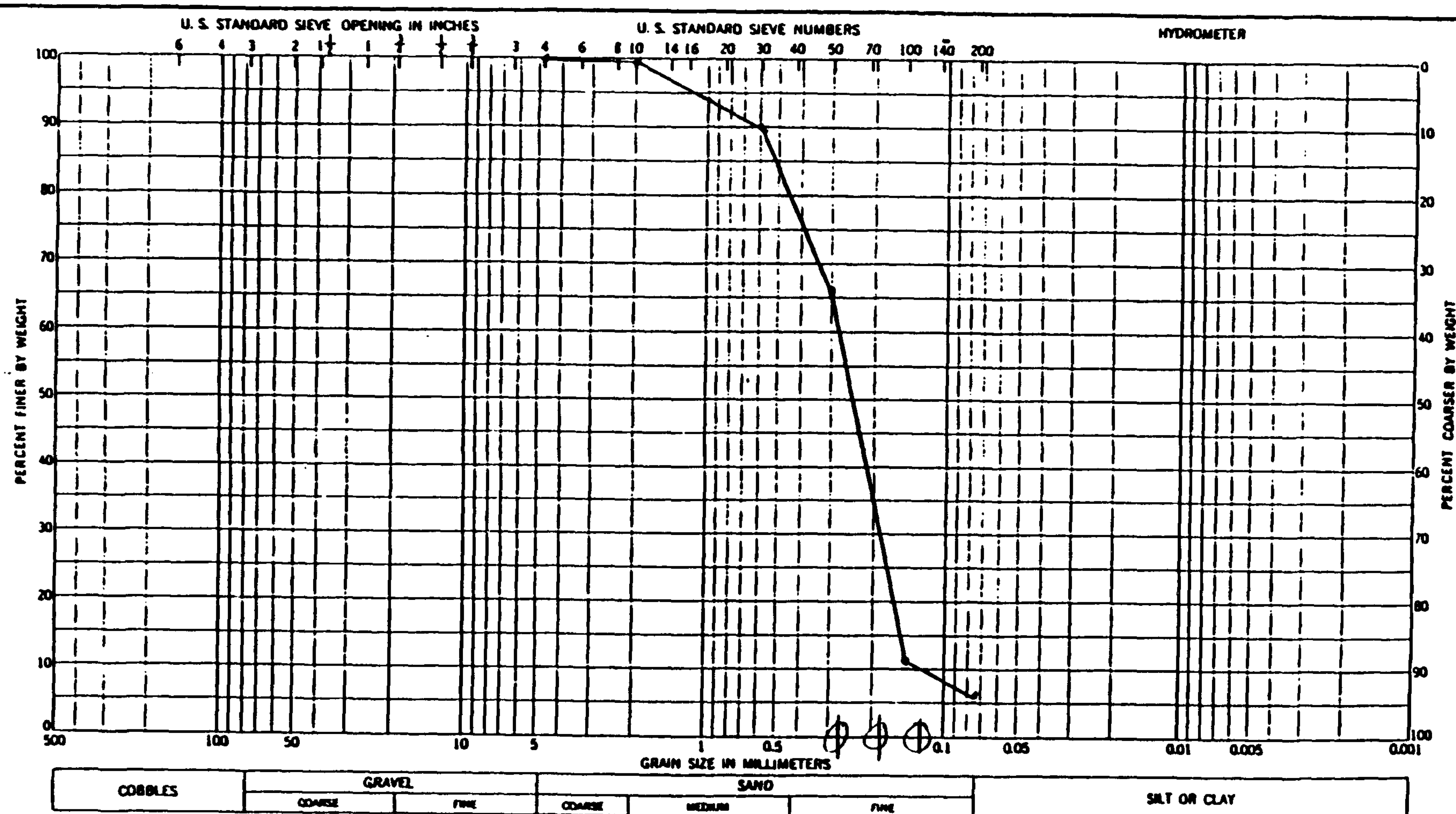
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DSB 5 48'-53'

Date 2/21/91

GRADATION CURVES

ENG FORM 1 MAY 63 2087

D_{10} .13 C_u 2.15

D_{30} .19

C_c 2

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/16/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 5

SAMPLE NUMBER: 76'-78'

DESCRIPTION OF SAMPLE: SP - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.)	WEIGHT AFTER PREWASHING (gm.)	WASHING LOSS (gm.)
343.1	318.2	24.9

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	343.1	100
4	0.3	342.8	99.9
10	3.7	339.1	98.8
30	38.4	300.7	87.6
50	186.5	114.2	33.3
100	69.9	44.3	12.9
NUMBER 200	16.0	28.3	8.3

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 3.0

B. WASHING LOSS (gm.): 24.9

TOTAL PASSING NO. 200 (gm.) (A. + B.): 27.9

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 342.7

ERROR (Original weight - total weight of fractions)(gm.): .4

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .12

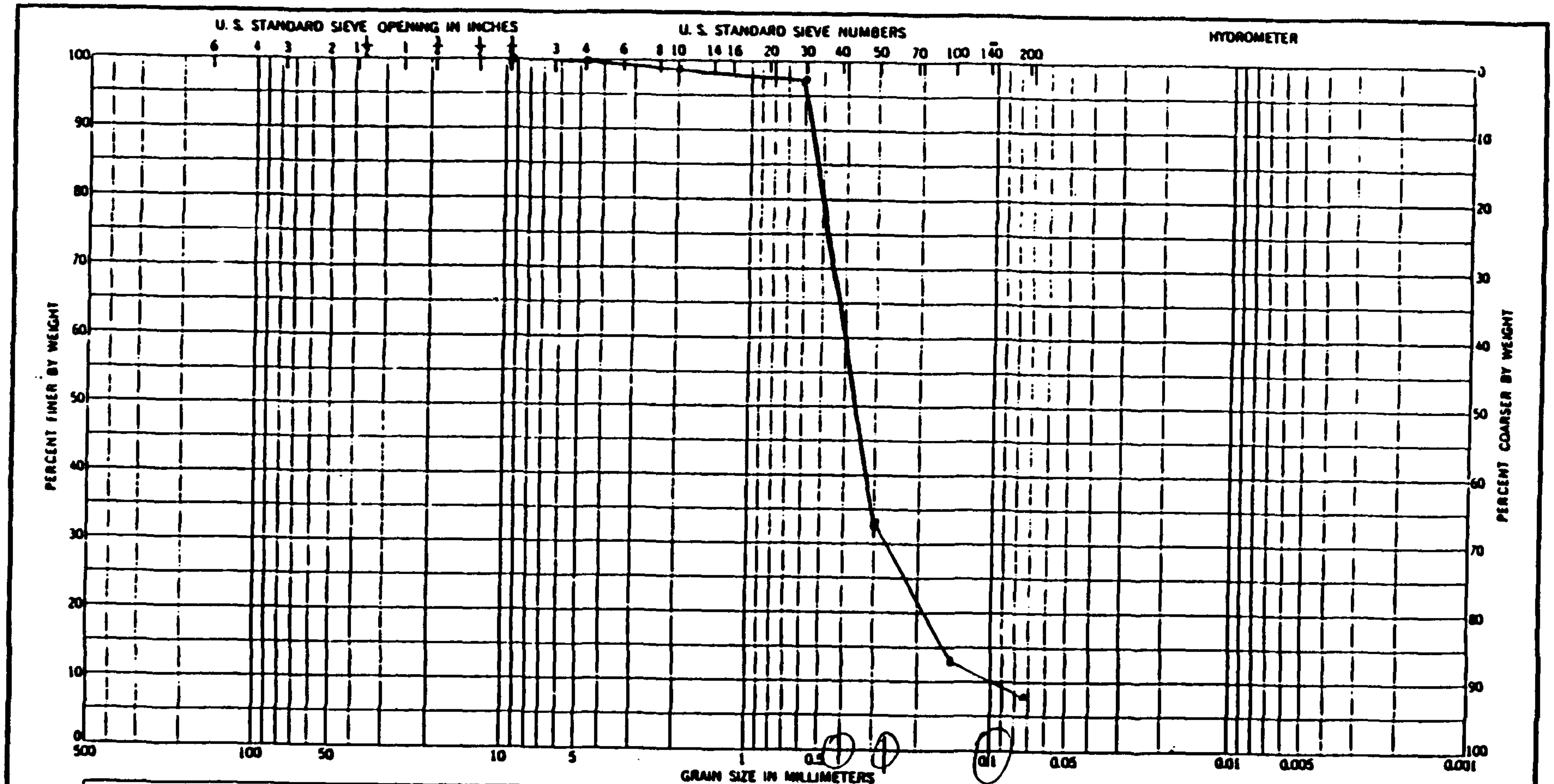
REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project	
Area	
Boring No.	DSB 5 76'-78'
Date	2/26/90

GRADATION CURVES

ENG FORM 1 MAY 63 2087

D_{10} .10
D_{30} .21 Cu 40
D_{60} .40

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/16/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 5

SAMPLE NUMBER: 105-8 -110-0

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 408.6

WEIGHT AFTER PREWASHING (gm.): 324.5

WASHING LOSS (gm.): 84.1

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	—	100
4	0	408.6	100
10	0.6	408.0	99.9
30	2.3	405.7	99.3
50	35.5	370.2	90.6
100	194.0	176.2	43.1
NUMBER 200	79.5	96.7	23.7

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 12.7

B. WASHING LOSS (gm.): 84.1

TOTAL PASSING NO. 200 (gm.) (A + B): 96.8

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 408.7

ERROR (Original weight - total weight of fractions)(gm.): .1

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .02

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE	4/16/90
PROJECT	REMEDIAL INVESTIGATION S.I.A.D. PHASE I
EXCAVATION NUMBER	OSB 5
SAMPLE NUMBER	6 125 I -130
DESCRIPTION OF SAMPLE	SW - SM
PREWASHED	☒ YES ☐ NO
WEIGHT ORIGINAL SAMPLE (gm.)	395.5
WEIGHT AFTER PREWASHING[1] (gm.)	367.5
WASHING LOSS[1] (gm.)	28.0

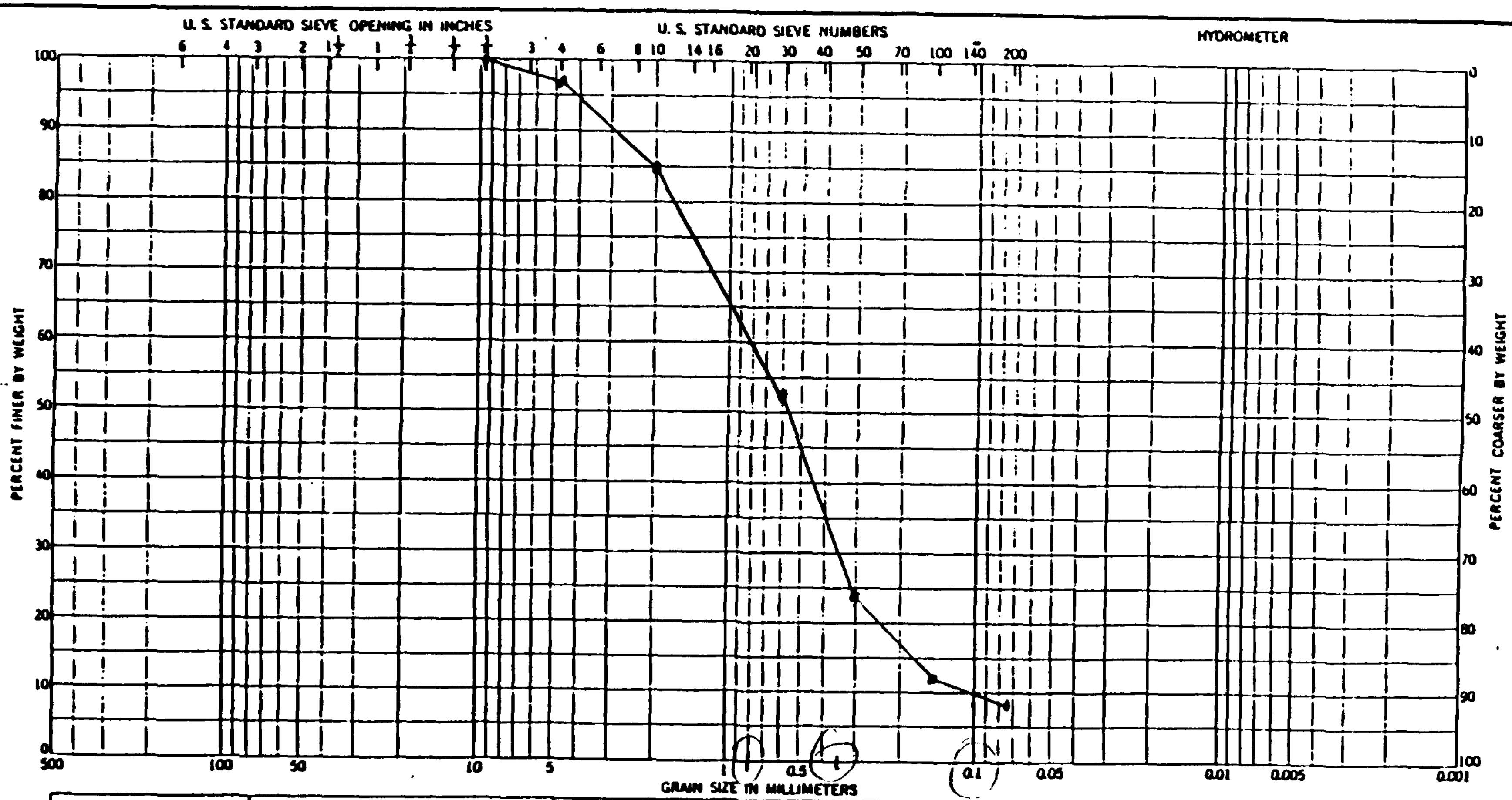
SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	395.5	100
4	9.5	386.0	97.6
10	49.0	337.0	85.2
30	129.0	208.0	52.6
50	111.9	96.1	24.3
100	48.0	48.1	12.2
NUMBER 200	16.5	31.6	8.0

A. WEIGHT SIEVED THROUGH NO. 200 (gm.)	2.7
B. WASHING LOSS[1] (gm.)	28.0
TOTAL PASSING NO. 200 (gm.) (A. + B.)	30.7
TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.)	394.6
ERROR (Original weight - total weight of fractions)(gm.)	0.9
PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$	.23

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature)	COMPUTED BY (Signature)	Job Number
Stephen H. Schmidt	Stephen H. Schmidt	90-25 A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DSII 5 125' - 130'6"

Date 2/22/90

GRADATION CURVES

ENG FORM 1 MAY 63 2087

D_{10} .10
D_{30} .31

C_u 8.0 C_c $\frac{.1225}{.08}$ C_c 1.5   SW - SM

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/16/90

PROJECT: REMEDIAL INVESTIGATION
S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 5

SAMPLE NUMBER: 150

DESCRIPTION OF SAMPLE: SW - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 393.0

WEIGHT AFTER PREWASHING (gm.): 361.8

WASHING LOSS (gm.): 31.2

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	393.0	100
4	14.2	378.8	96.4
10	53.0	325.8	82.9
30	91.0	234.8	59.8
50	115.1	119.7	30.5
100	66.0	53.7	13.7
NUMBER 200	19.2	34.5	8.8

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 4.0

B. WASHING LOSS (gm.): 31.2

TOTAL PASSING NO. 200 (gm.) (A. + B.): 35.2

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 393.7

ERROR (Original weight - total weight of fractions)(gm.): .7

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .18

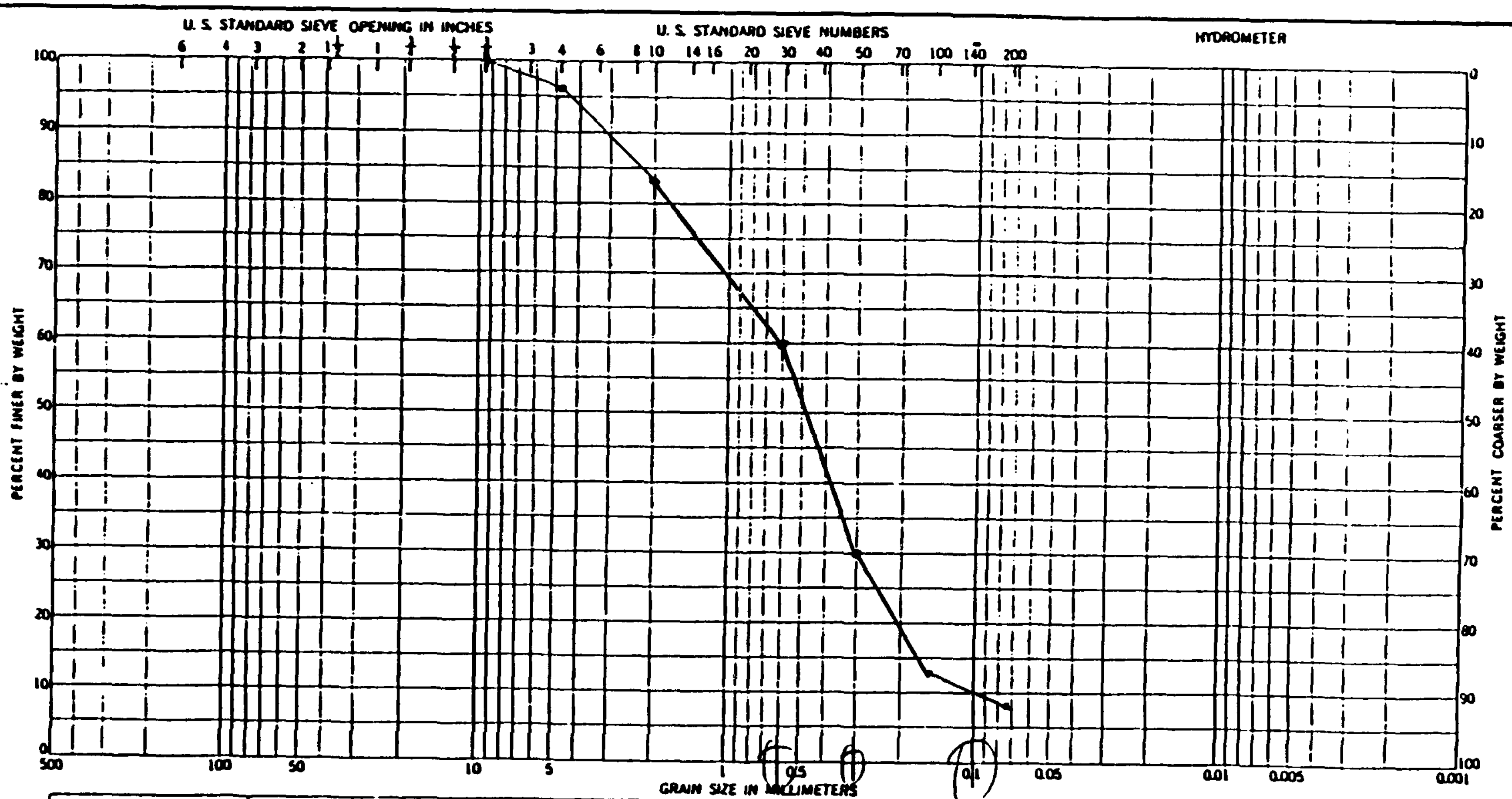
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): [signature]

COMPUTED BY (Signature): [signature]

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DSB 5 150'

Date 2/27/90

GRADATION CURVES

ENG FORM 1 MAY 63 2087

D_{10} .10 D_{30} .30 C_u 6.0 C_c $\frac{.09}{.16}$ = 1.50   SW - SM

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/16/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 5

SAMPLE NUMBER: 170'-175'

DESCRIPTION OF SAMPLE: SP-SM

PREWASHED: [X] YES [ ] NO

WEIGHT ORIGINAL SAMPLE (gm.): 317.7

WEIGHT AFTER PREWASHING (gm.): 288.4

WASHING LOSS (gm.): 29.3

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	317.7	100
4	2.1	315.6	99.3
10	12.4	303.2	95.4
30	26.4	276.8	87.1
50	124.8	152.0	47.8
100	96.0	56.0	17.6
NUMBER 200	23.0	33.0	10.4

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 3.2

B. WASHING LOSS (gm.): 29.3

TOTAL PASSING NO. 200 (gm.) (A. + B.): 32.5

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 317.2

ERROR (Original weight - total weight of fractions)(gm.): 0.5

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .16

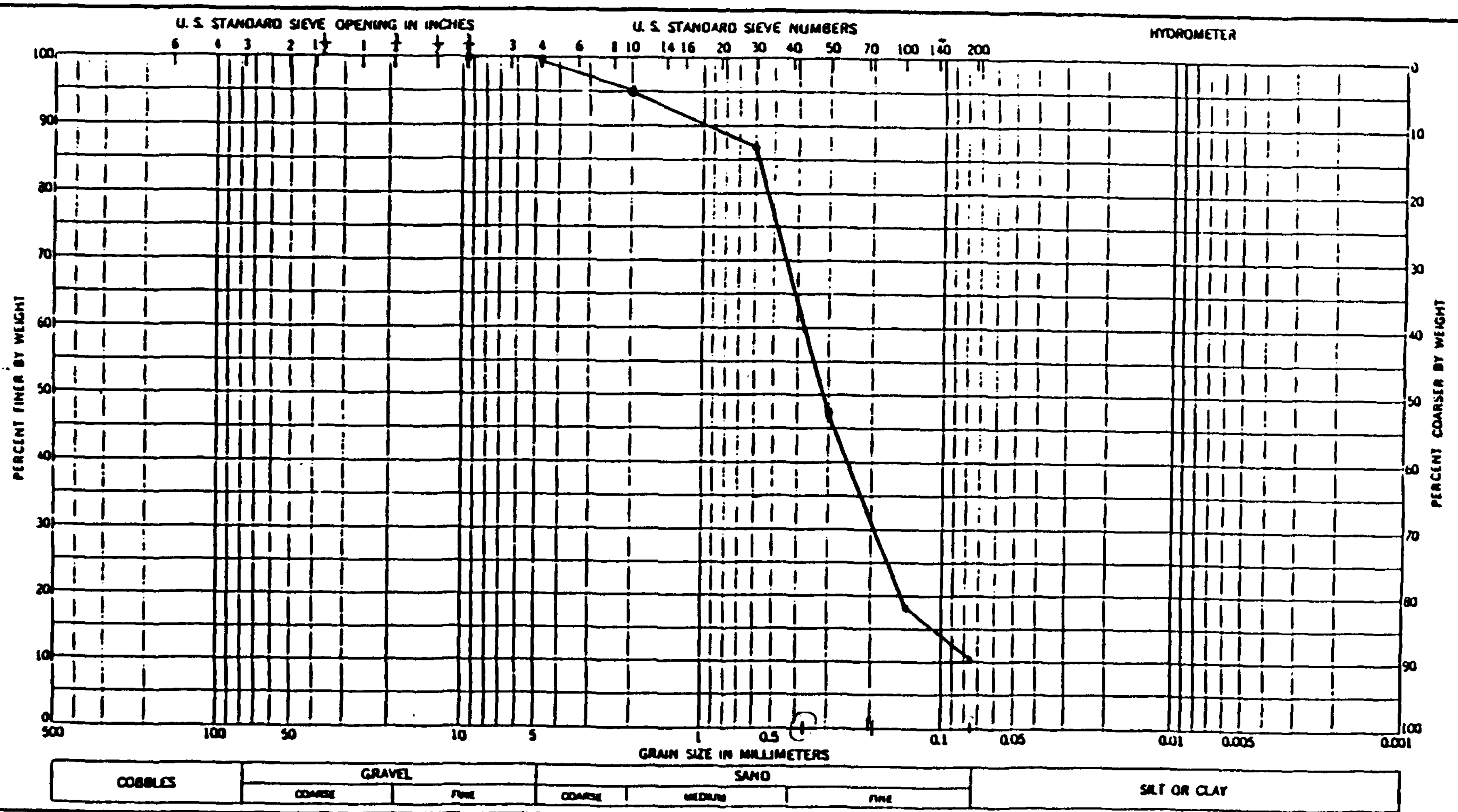
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmidt

COMPUTED BY (Signature): Stephen H Schmidt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DSB 5 170'-175'

Date

GRADATION CURVES

ENG FORM 2087 D_{10} .075

NST Engineering Associates, Inc

Planning Surveying Engineering

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4-16-90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: DSB-5

SAMPLE NUMBER: 200'-203'

DESCRIPTION OF SAMPLE: SM

PREWASHED: [X] YES [ ] NO

WEIGHT ORIGINAL SAMPLE (gm.): 282.7

WEIGHT AFTER PREWASHING (gm.): 253.1

WASHING LOSS (gm.): 29.6

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	282.7	100
4	0.3	282.4	17.9
10	1.4	281.0	77.4
30	28.6	252.4	89.3
50	71.5	164.9	58.3
100	104.0	60.9	21.5
NUMBER 200	26.2	34.7	12.3

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 4.9

B. WASHING LOSS (gm.): 29.6

TOTAL PASSING NO. 200 (gm.) (A. + B.): 34.5

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 282.5

ERROR (Original weight - total weight of fractions)(gm.): .2

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .07

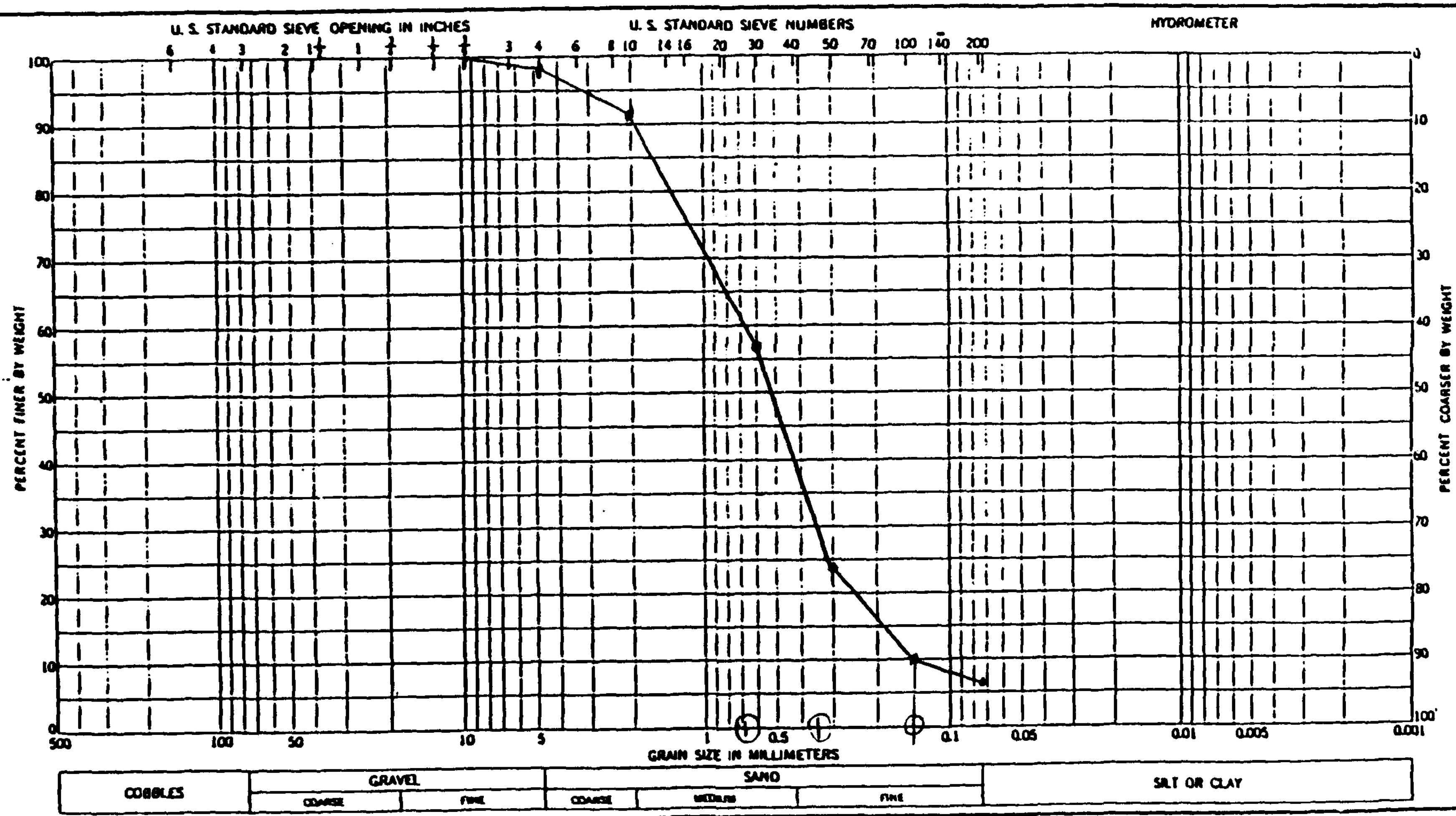
REMARKS:

SAMPLE IS NON-PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DSB 6 246' - 250'

NST Engineering Associates, Inc

Planning · Surveying · Engineering

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/30/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: OSB 6

SAMPLE NUMBER: 246' - 250'

DESCRIPTION OF SAMPLE: SP SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 583.9

WEIGHT AFTER PREWASHING (gm.): 558.3

WASHING LOSS (gm.): 25.6

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	583.9	100
4	10.6	573.3	98.2
10	36.1	537.2	92.0
30	208.8	328.4	56.2
50	186.4	142.0	24.3
100	85.2	56.8	9.7
NUMBER 200	22.7	34.1	5.8

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 7.2

B. WASHING LOSS (gm.): 25.6

TOTAL PASSING NO. 200 (gm.) (A. + B.): 32.8

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 582.5

ERROR (Original weight - total weight of fractions)(gm.): 1.3

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .22

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmitt

COMPUTED BY (Signature): Stephen H Schmitt

Job Number 90-25 A

NST Engineering Associates, Inc

Planning · Surveying · Engineering

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/30/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: OSB 6

SAMPLE NUMBER: 220 5 -231

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 419.0

WEIGHT AFTER PREWASHING (gm.): 345.2

WASHING LOSS (gm.): 73.8

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	—	100
4	0	419.0	100
10	12.8	406.2	97.0
30	84.0	322.2	76.9
50	95.3	226.9	54.2
100	87.7	139.2	33.2
NUMBER 200	53.5	85.7	20.5

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 12.1

B. WASHING LOSS (gm.): 73.8

TOTAL PASSING NO. 200 (gm.) (A. + B.): 85.9

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 419.2

ERROR (Original weight - total weight of fractions)(gm.): 0.2

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .05

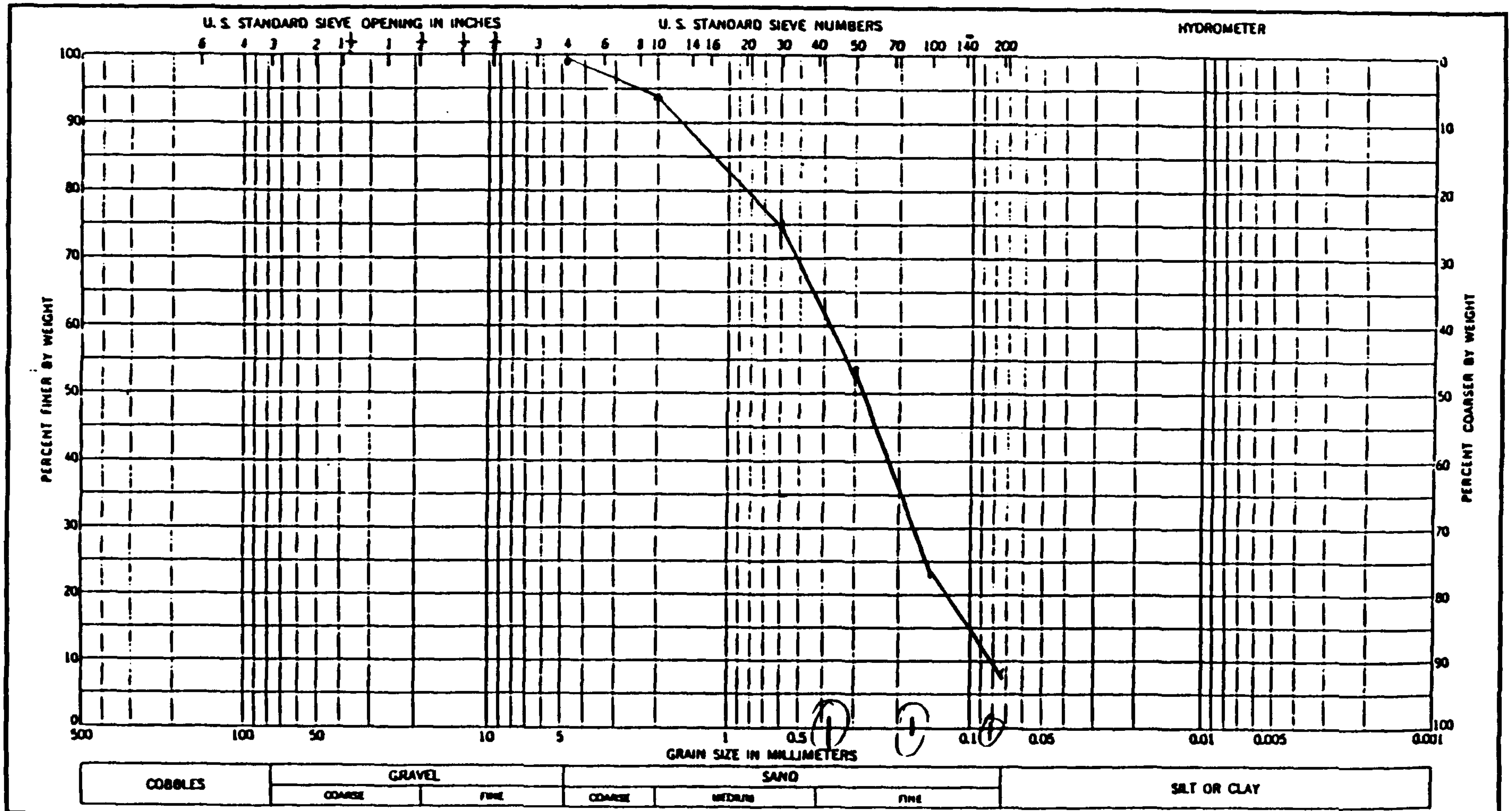
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H Schmidt

COMPUTED BY (Signature): Stephen H Schmidt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DSB 6 201' - 206'

Date 3/5/90

GRADATION CURVES

ENG FORM 2087

D10 . . 08
D. . . 1 . 40

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/30/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: OSB 6

SAMPLE NUMBER: 201 - 206

DESCRIPTION OF SAMPLE: SP-SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 573.9

WEIGHT AFTER PREWASHING[1] (gm.): 539.0

WASHING LOSS[1] (gm.): 34.9

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE: WEIGHT (gm.)	PASSING SIEVE: PERCENT
a	b	c	d
3/8	0	573.9	100
4	4.6	569.3	99.2
10	30.6	538.7	93.9
30	108.7	430.7	75.1
50	125.2	304.8	53.1
100	172.7	132.1	23.0
NUMBER 200	86.1	46.0	8.0

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 10.9

B. WASHING LOSS[1] (gm.): 34.9

TOTAL PASSING NO. 200 (gm.) (A + B): 45.8

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 573.7

ERROR (Original weight - total weight of fractions)(gm.): .2

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .03

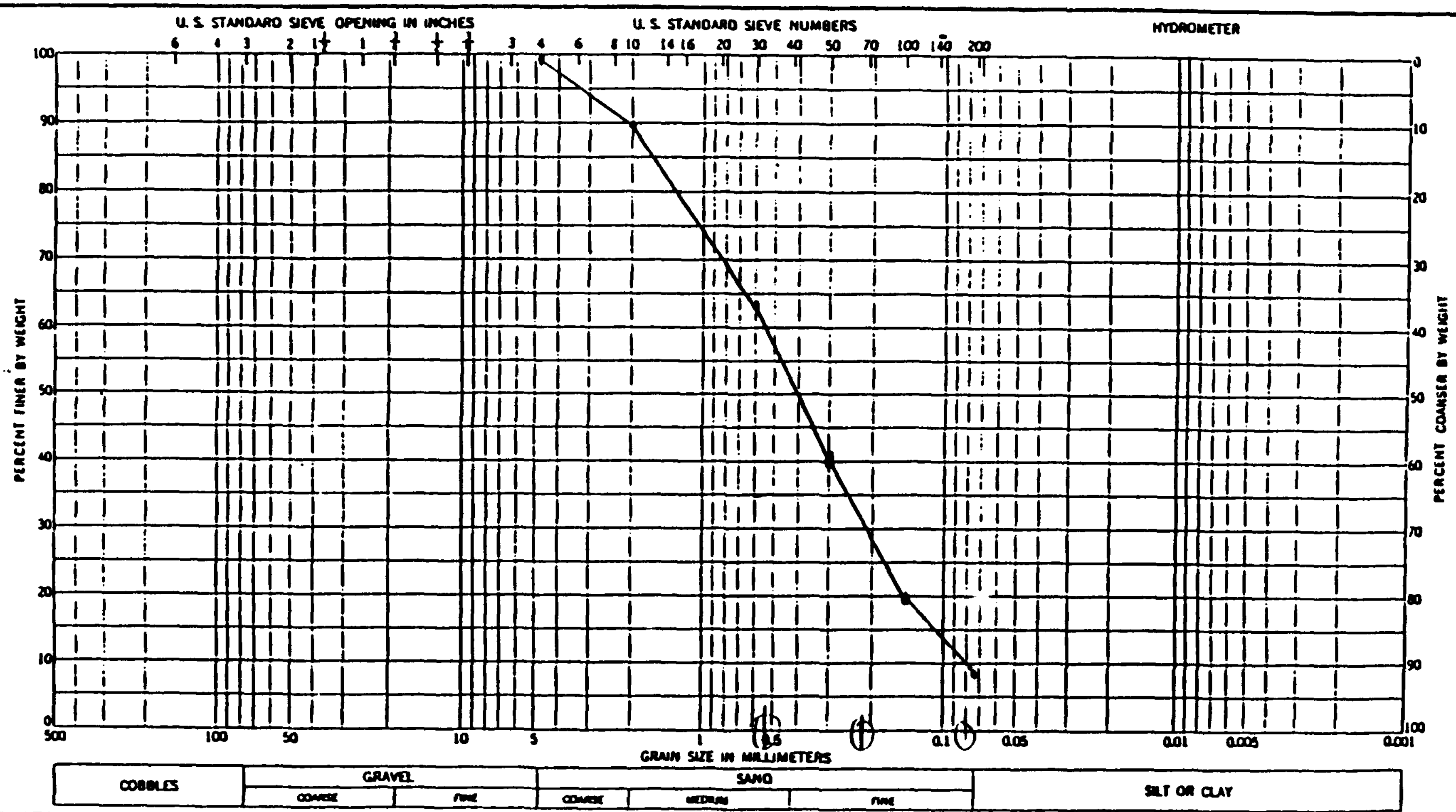
REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number: 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. D-5B 6 153'-158'

Date

GRADATION CURVES

ENG , FORM , 2087 D_{10} .08 6.8 .048 1.12

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 7/30/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: DSB 6

SAMPLE NUMBER: 153' - 158'

DESCRIPTION OF SAMPLE: SW - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 574.5

WEIGHT AFTER PREWASHING (gm.): 535.9

WASHING LOSS (gm.): 38.6

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	574.5	100
4	5.1	569.4	99.1
10	54.8	514.6	89.6
30	151.3	363.3	63.2
50	130.8	232.5	40.5
100	119.8	112.7	19.6
NUMBER 200	65.0	47.7	8.3

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 8.7

B. WASHING LOSS (gm.): 38.6

TOTAL PASSING NO. 200 (gm.) (A. + B.): 47.3

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 574.1

ERROR (Original weight - total weight of fractions)(gm.): .4

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .07

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmitt

COMPUTED BY (Signature): Stephen H. Schmitt

Job Number 90-25 A

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/30/90

PROJECT: S.I.A.D. REMEDIAL INVESTIGATION PHASE I

EXCAVATION NUMBER: OSB 6

SAMPLE NUMBER: 126'-131'

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 746.8

WEIGHT AFTER PREWASHING (gm.): 660.7

WASHING LOSS (gm.): 86.1

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	746.8	100
4	2.3	744.5	99.7
10	35.1	709.4	95.0
30	145.0	564.4	75.6
50	151.0	413.4	55.4
100	171.6	241.8	32.4
NUMBER 200	131.0	110.8	14.8

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 23.8

B. WASHING LOSS (gm.): 86.1

TOTAL PASSING NO. 200 (gm.) (A. + B.): 109.9

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 745.9

ERROR (Original weight - total weight of fractions)(gm.): 0.9

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .12

REMARKS

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc

Planning · Surveying · Engineering

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/30/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 6

SAMPLE NUMBER: 75⁵ - 80⁵

DESCRIPTION OF SAMPLE: ML

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 254.7

WEIGHT AFTER PREWASHING (gm.): 133.1

WASHING LOSS (gm.): 121.6

SIEVE OR SCREEN (a)	WEIGHT RETAINED ON SIEVE (gm.) (b)	PASSING SIEVE WEIGHT (gm.) (c)	PASSING SIEVE PERCENT (d)
3/8	0	254.7	100
4	0.2	254.5	99.9
10	1.1	253.4	99.5
30	3.2	250.2	98.2
50	1.5	248.7	97.6
100	15.5	233.2	91.6
NUMBER 200	81.4	151.8	59.6

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 30.7

B. WASHING LOSS (gm.): 121.6

TOTAL PASSING NO. 200 (gm.) (A + B): 152.3

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 255.2

ERROR (Original weight - total weight of fractions)(gm.): .5

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .2

REMARKS:

SAMPLE IS NON PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc
45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/30/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: OSB 6

SAMPLE NUMBER: 56.5 - 60.5

DESCRIPTION OF SAMPLE: SC

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 319.1

WEIGHT AFTER PREWASHING (gm.): 171.0

WASHING LOSS (gm.): 148.1

SIEVE OR SCREEN	WEIGHT RETAINED ON SIEVE (gm.)	PASSING SIEVE WEIGHT (gm.)	PASSING SIEVE PERCENT
a	b	c	d
3/8	0	319.1	100
4	0.9	318.2	99.7
10	6.9	311.3	97.6
30	30.4	280.9	88.0
50	33.3	247.6	77.6
100	51.9	195.7	61.3
NUMBER 200	37.9	157.8	49.5

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 9.0

B. WASHING LOSS (gm.): 148.1

TOTAL PASSING NO. 200 (gm.) (A. + B.): 157.1

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 318.4

ERROR (Original weight - total weight of fractions)(gm.): 0.7

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .22

REMARKS

L.L. = 29
P.L. = 19
P.I. = 10

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A

NST Engineering Associates, Inc

45 South Hoop Street • Susanville, California 96130

Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4/30/90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 6

SAMPLE NUMBER: 22-26.5

DESCRIPTION OF SAMPLE: SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 309.6

WEIGHT AFTER PREWASHING (gm.): 226.6

WASHING LOSS (gm.): 83.0

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	309.6	100
4	0.3	309.3	99.9
10	1.9	307.4	99.3
30	41.9	265.5	85.8
50	91.9	173.6	56.1
100	56.6	117.0	37.8
NUMBER 200	26.6	90.4	29.2

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 6.8

B. WASHING LOSS (gm.): 83.0

TOTAL PASSING NO. 200 (gm.) (A. + B.): 89.8

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 309.0

ERROR (Original weight - total weight of fractions)(gm.): 0.6

PERCENT ERROR $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$: .19

REMARKS

L.L. = 25

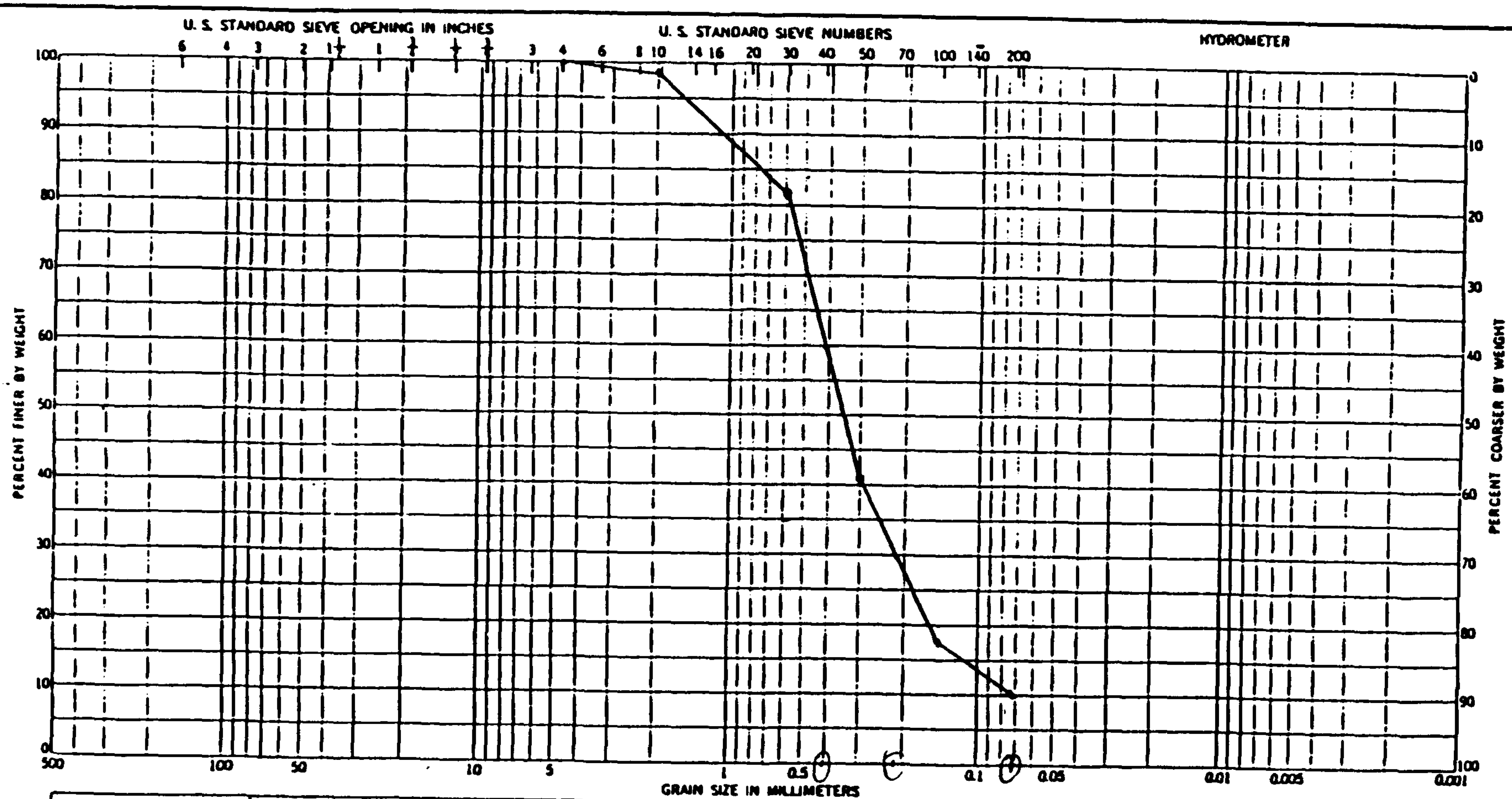
P.L. = 21

P.I. = 4

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. 5

Date

GRADATION CURVES

ENG FORM 2087

D_{10} .07

Planning · Surveying · Engineering

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 1-16-90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 5

SAMPLE NUMBER: 247-249

DESCRIPTION OF SAMPLE: SP - SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 415.9

WEIGHT AFTER PREWASHING[1] (gm.): 380.9

WASHING LOSS[1] (gm.): 35.0

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE WEIGHT (gm.) c	PASSING SIEVE PERCENT d
3/8	0	415.9	100
4	0.3	415.6	99.9
10	4.5	411.1	98.8
30	72.0	339.1	81.5
50	170.0	169.1	40.7
100	95.6	73.5	17.7
NUMBER 200	31.5	42.0	10.1

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 6.2

B. WASHING LOSS[1] (gm.): 35.0

TOTAL PASSING NO. 200 (gm.) (A. + B.): 41.2

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 415.1

ERROR (Original weight - total weight of fractions)(gm.): 0.8

PERCENT ERROR ($\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100$): .19

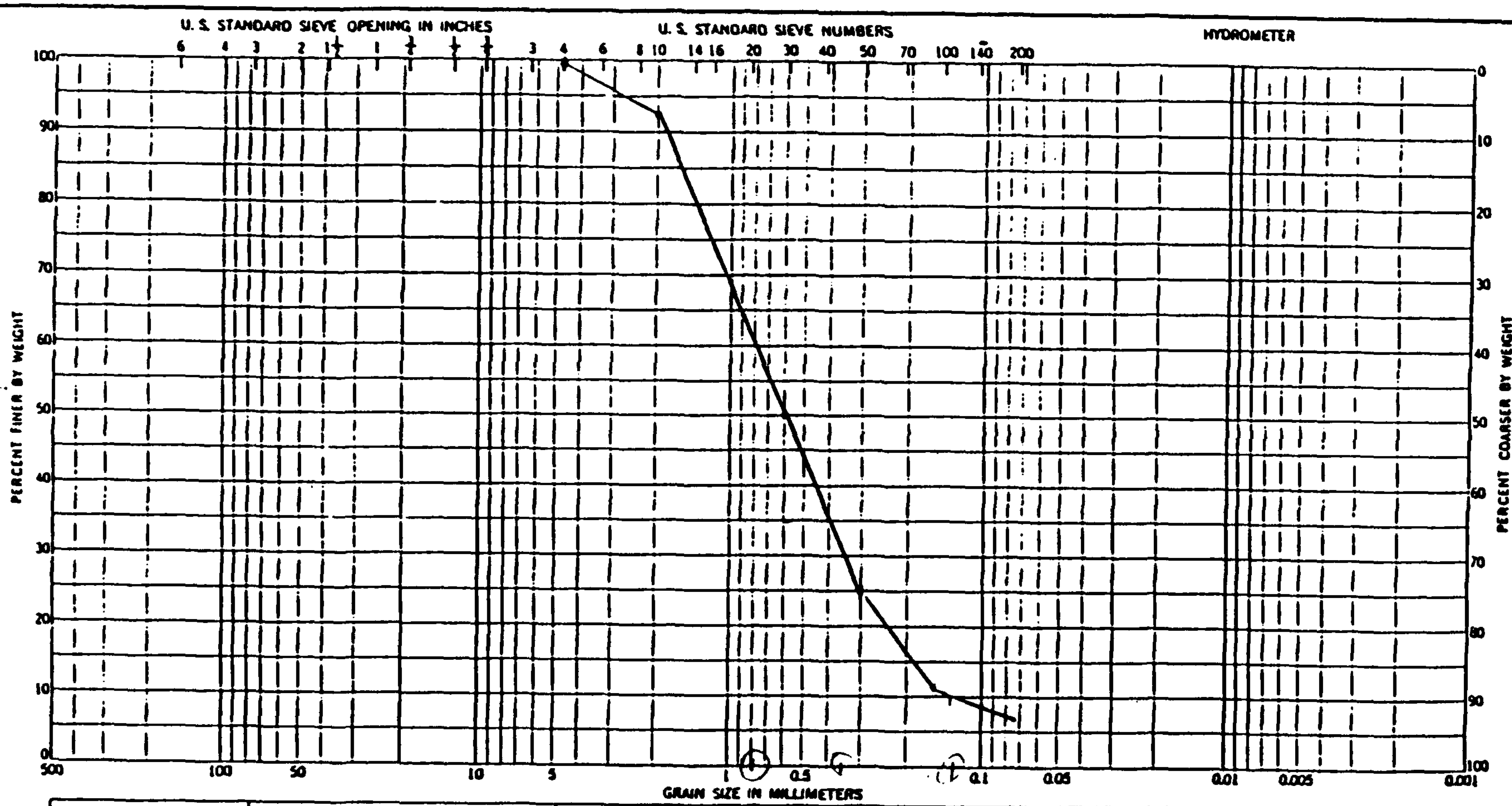
REMARKS:

SAMPLE IS NON-PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI

Project

Area

Boring No. DSB 5 225' - 27'

Date

GRADATION CURVES

ENG FORM 1 MAY 63 2087 D_{10} .14 D_{30} .31 C_u 5.7 C_c $\frac{(.31)^2}{}$ = 1.09

CP - CM

Planning Surveying Engineering

NST Engineering Associates, Inc

45 South Roop Street • Susanville, California 96130
Telephone (916) 257-5173

SIEVE ANALYSIS DATA

DATE: 4-15-90

PROJECT: REMEDIAL INVESTIGATION S.I.A.D. PHASE I

EXCAVATION NUMBER: DSB 5

SAMPLE NUMBER: 225-230

DESCRIPTION OF SAMPLE: SP-SM

PREWASHED: ☒ YES ☐ NO

WEIGHT ORIGINAL SAMPLE (gm.): 358.3

WEIGHT AFTER PREWASHING¹ (gm.): 338.3

WASHING LOSS¹ (gm.): 20.0

SIEVE OR SCREEN a	WEIGHT RETAINED ON SIEVE (gm.) b	PASSING SIEVE: WEIGHT (gm.) c	PASSING SIEVE: PERCENT d
3/8	0	358.3	100
4	2.5	355.8	99.3
10	24.3	331.5	92.5
30	153.0	178.5	49.8
50	87.5	91.0	25.4
100	50.5	40.5	11.3
NUMBER 200	16.4	24.1	6.7

A. WEIGHT SIEVED THROUGH NO. 200 (gm.): 3.1

B. WASHING LOSS¹ (gm.): 20.0

TOTAL PASSING NO. 200 (gm.) (A. + B.): 23.1

TOTAL WEIGHT OF FRACTIONS (Total of all entries in Col. b) (gm.): 357.6

ERROR (Original weight - total weight of fractions)(gm.): .7

PERCENT ERROR: $\left(\frac{\text{Error (gm.)}}{\text{Original weight (gm.)}} \times 100\right)$ .20

REMARKS:

SAMPLE IS NON-PLASTIC

TECHNICIAN (Signature): Stephen H. Schmidt

COMPUTED BY (Signature): Stephen H. Schmidt

Job Number 90-25 A

Appendix H

Borehole Geophysical Survey

JMM James M. Montgomery

Consulting Engineers Inc.

APPENDIX H
BOREHOLE GEOPHYSICAL SURVEY

H.1 - Techniques and Field Operations Procedures

The borehole geophysical survey for SIAD Phase I RI was conducted by Welenco Incorporated of Sparks, Nevada. Surveys performed were electric logging which consisted of spontaneous potential and resistivity, caliper logging, and gamma ray logging. Electric and caliper logs were run on all six deep soil borings while the gamma ray log was run only on DSB-3. In each case the Welenco technician would arrive on site soon after the boring was completed. The logs would be run by lowering the instruments downhole and raising them back up by a means of a boom and winch mounted on the Welenco van. A field copy of each log was presented to the JMM Field Operations Leader upon completion of each survey run. A more detailed description of the geophysical logs, compiled from the Welenco manual, follows this discussion.

H.2 - Quality Assurance

The quality of data collected on the geophysical logs was assured by implementation of a few simple steps prior to and during the logging procedure. These steps included calibration of the caliper, gamma ray, and electric log equipment prior to use, circulation of fresh drilling mud into the borehole prior to geophysical logging, and measurement of the fresh drilling mud for temperature and resistivity. The caliper survey increases the accuracy of the gamma ray and electric logs since borehole diameter affects the results of these two surveys. The caliper was calibrated by lowering the instrument down the borehole to the bottom. The caliper log was then run from the bottom of the borehole to the ground surface.

H.3 - Log Procedures

The caliper log was run by lowering the caliper downhole suspended from a armoured cable running through the beam on the Welenco van. The caliper scale was calibrated as the caliper was lowered downhole. When the bottom of the borehole was reached the recorder was switched on and the caliper was raised in the borehole until the surface was reached. All data was recorded on the surface. The log for each borehole was complete when the caliper reached the surface.

The electric log and gamma ray log were both run in a similar manner to the caliper log. Each of these instruments was calibrated on the downhole run prior to running the survey. In the case of the electric log a sample of the drilling mud was measured for resistivity and temperature to provide a point of reference for the survey.

H.4 - Log Interpretation

The caliper log is easily interpreted since it records average borehole diameter along the entire borehole depth. At SIAD, it was used to help interpret the electric and gamma ray logs since these logs are dependent on borehole diameter.

The electric log measures spontaneous potential and resistivity. A more detailed definition of spontaneous potential and resistivity may be found in Appendix H.1. Spontaneous potential is a useful tool for determining water quality. A positive spontaneous potential indicates that the drilling mud is saltier than the formation water and a negative spontaneous potential indicates that the drilling mud is fresher than the formation water. If water is present in a formation or strata and the permeability is high either a positive or negative spontaneous potential would be recorded on the electric log depending on water quality. If there is no water present in a formation or if the permeability is very low a spontaneous potential of zero or close to zero would be recorded. This data can be used to separate clay layers from sand or gravel layers within a formation.

Resistivity is the resistance of a sediment to the passage of an electrical current per unit volume. Since water in pore spaces is primarily responsible for the conductance of electricity in sediments, the resistivity log is used to interpret the presence, quantity and quality of water in a formation. This in turn aids in the estimation of porosity of a sediment which may be correlated to grain size.

The gamma ray log measures the naturally occurring gamma emissions from the formation surrounding the borehole. The most common naturally occurring source of gamma emissions is Potassium 40 (K40). K40 is found in many common clay minerals thus making the gamma ray log a useful tool for determining the presence of clay minerals in a sediment. This makes it possible to estimate grain size and consequently permeability and porosity. It is primarily useful as a correlation tool with electric logs. These logs were used in correlation with the boring logs to interpret the nature of the subsurface and to help determine depositional environment.

H.5 - Summary of Logging Results

The caliper log was used solely to determine borehole diameter thus facilitating the interpretation of the electric and gamma ray logs.

The gamma ray log was run only on one deep soil boring, DSB-3. It was determined at that time that the gamma ray log had no correlation to the substrate at Sierra Army Depot. This could be due to the presence of a radioactive isotope that emits gamma rays but is not present in clay minerals (i.e., Uranium 235 or Uranium 238) or the presence of clay minerals that contain very little or no K40 or Thorium 232 (TH232) which is another common isotope found in clay minerals.

The electric logs were found to correlate very closely with the boring logs recorded by the JMM site geologist on the deep soil borings. The SP logs and the resistivity logs both indicated relatively fine-grained layers and coarser grained layers that coincided with those logged during borehole advancement. In the case of DSB-4, the electric log showed very little evidence of changing SP or resistivity. This was in complete

correlation with the JMM geologist log which documented a silty sand for almost the entire 250 foot depth.

The results of the electric log also gave an indication of water quality at SIAD. All water in the formations down to 250 feet in depth were determined to be Class II or Class III water. Class II water has a total dissolved solids (TDS) concentration of 700 to 2,000 mg/l and Class III water has a TDS concentration of greater than 2,000 mg/l. Copies of the geophysical logs may be found at the end of Appendix H.

1

INTRODUCTION

Today's tremendous and ever-increasing demands for water for suburban homes, for industries, for modern farming and for expanding cities have rendered yesterday's hit-and-miss methods of water seeking hopelessly inadequate. The effective investigation of underground water in any area requires (1) locating the water-bearing formations; (2) determining their water quality and (3) estimating their yield. Although surface exploration methods can be used to obtain general geological information on the area, only drilling, logging and testing of wells will accurately solve these problems.

The geophysical logs commonly run in water wells are similar in every respect to those run in oil and gas wells. In 1927, what would become the widest application of electrical surveying was attempted: the electrical surveying of a borehole by running a probe attached to the end of a cable into the well bore. Now, *nearly all wells drilled for gas* and oil along with a goodly number drilled for water are systematicaly *logged*. It is not surprising that, pursuant to the federal Clean Water Act, many California counties now require that logs be run under conditions where waters of different qualities may be encountered during drilling.

The purpose of this paper is to provide an explanation of some of the more commonly used geophysical logging techniques, how they work and what can be done with them to enhance the search for and recovery of more water.

Chart I-1 lists the tools that are generally available to the water well industry and how they are used in solving a variety of problems. Some of these tools can be used in both open and cased hole surveys, while others are restricted to use in open holes only because they depend on electrical signals that are short circuited by steel casing. The tools listed are run into wells on an armored cable which surrounds from one to seven insulated copper conductors. The tools which have electronics in the downhole sonde usually can be run on a cable that has one conductor, while those that have multiple contact points on the downhole sonde and no electronics downhole require one conductor for each measuring contact and are run on cables with four to seven conductors. Figure I-1 is a block diagram of the logging equipment used to obtain the logs described in this paper. The equipment is usually truck mounted and may make use of a very short, small diameter cable or, in the case of equipment also used for logging oil wells, be mounted in a large truck with 30,000 feet of heavy cable.

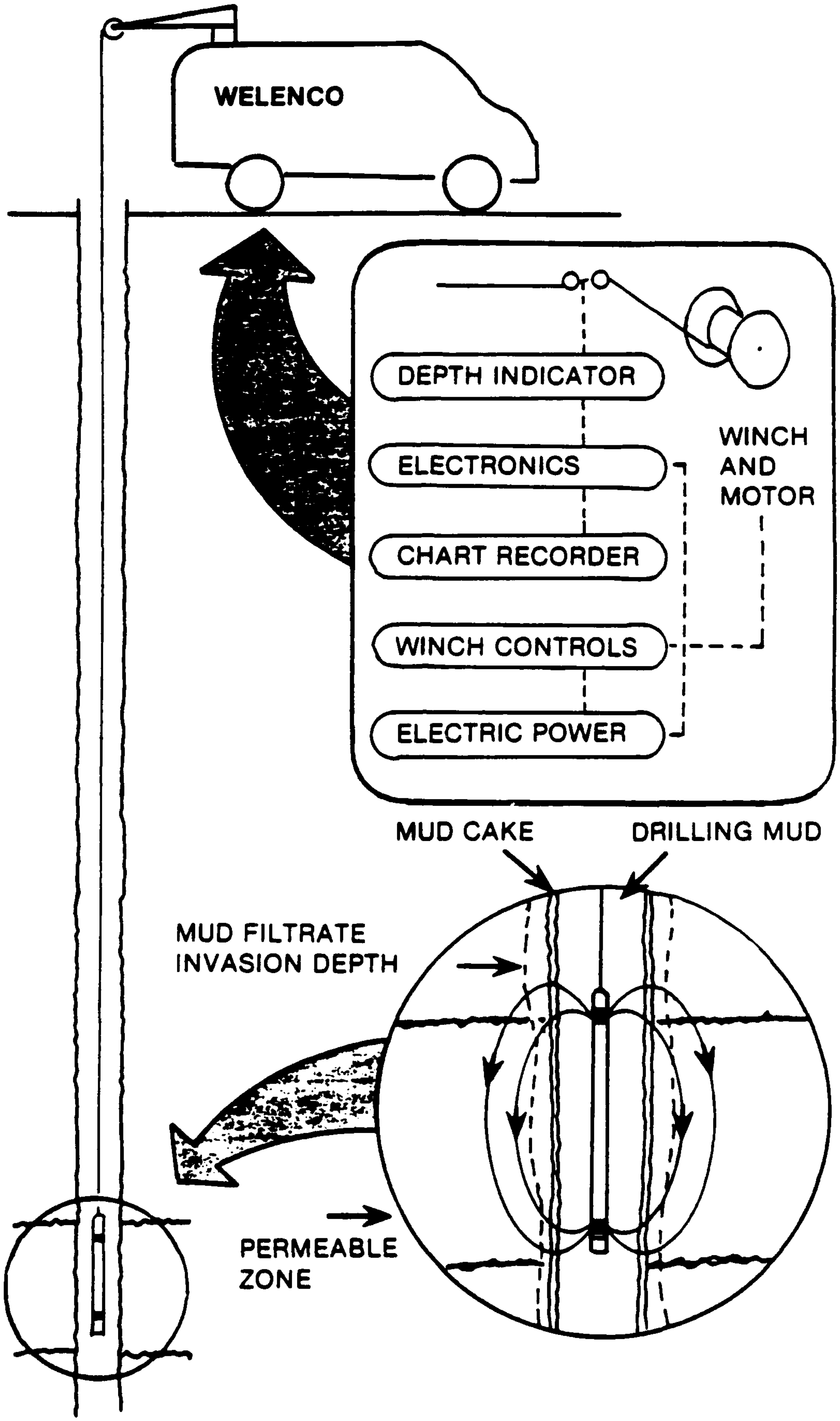


Figure I-1
Schematic of Geophysical Well Logging System

In order to obtain the greatest amount of information from a logging program, some pre-planning is definitely in order. It has been stated that log interpretation is more of an art than a science because different phenomena can cause similar log responses. For that reason it is imperative that the proper logs be run in any given situation, that the logs be properly calibrated and presented, that necessary associated information be obtained and tabulated and that the analysis of these logs be made by an analyst familiar with the area. For optimum information from an electric log, borehole geometry and some drilling fluid control should be considered. Logging tool sizes and access to well bores must be taken into account for some of the logs that might be run during the producing life of a well. Proper planning is the only way to obtain the greatest benefit from logs for the least expense.

The cardinal problem at the well is what to do with the hole you have just drilled. In few cases can the operator simply run a log and solve all his problems. To be of any great value, the log must distinguish between non-productive and possible productive formations. In wildcat areas, aside from indicating clear cut dry holes, all that should be expected of the initial log by itself is that it form a basis for wisely and economically selecting the various auxilliary evaluation or testing methods that may be necessary for deciding to pass up a dry hole or setting pipe in a productive well. Proper evaluation of the initial electric log may greatly reduce the number of unknowns and save unnecessary and costly mistakes. The spending of a few hours on the study of the log and other available information at the well is certainly not out of proportion to the total investment. Electric logs supply many known values from which to work.

Different wells call for different evaluation methods. Where drill cuttings and electric log studies may be all that are needed for a particular well, additional logs and studies may be necessary for evaluation of other wells. Today it is almost universally conceded that drill cutting study and an electric log are bare essentials for rotary holes. If the use of these two parameters answer all of your questions you need go no further. When there are still some unanswered questions, the question then arises, "how much information can I afford?"

Usually, the most difficult logs to interpret are those on which only a few sands are logged. Electric log interpretation is not really a science, but rather an art. Nature cannot be put into equations in a straightforward manner except through the intermediate process of data collection and statistical studies; and Geology is a natural science.

Not all problems encountered in log analysis are attributable to nature. The human being has his responsibilities too.

The logging engineer bears the largest responsibility. His measurements must be correct and he must be able to recognize that they are. So should the hydrogeologist who is going to interpret the results.

2

ELECTRIC LOGGING

Although primitive electric logs were made throughout Europe on a more or less experimental basis for many years, electric logging was not introduced on a commerical basis until 1929 when the Schlumberger brothers began running crude resistivity logs on oil wells near Alsace, France. These logs were an outgrowth of surface resistivity plots. In 1931, during the course of running one of these resistivity logs, the downhole current supply was accidentally disconnected and, instead of recording zero signal as expected, a signal was still present on the recording meter. The equipment was simply measuring a potential which was being generated in the borehole, hence the discovery of the Spontaneous Potential or SP which is still a part of every electric log run today.

The present day conventional electric log consists of the SP curve along with two or more resistivity curves of varying depths of investigation into the wall of the borehole, often implemented by several distinct types of electrode arrangements.

The electric log is an excellent correlation tool. This means that the electric log gives a good indication of the general type of material of which each bed is composed (sand, clay, limestone, etc.) as well as exactly where they are located in depth relative to some point at the surface. This, in turn, allows many beds to be recognized by some commonly-used name and to be fitted into the known geologic sequence in the area. Also it is possible to determine the amount of pore space contained in the formation and the amount and kind of fluids contained in this pore space. How well the porosity and fluid information can be determined depends on how accurately the interpreter knows a number of factors in the well, such as mud resistivity, temperature, formation water resistivity, depth of invasion into the formation by the mud filtrate, etc. The value of these determinations is also affected by how well the interpreter can correct certain inherent errors caused by geometric factors such as sonde diameter, borehole diameter and bed thickness. The amount of information that can be derived from logs is generally a function of the background information available, the number of different types of logs run and the experience of the analyst. Electric log interpretation is not really a science, but rather an art. Nature cannot be put into equations in a straight-forward manner except through the intermediate process of data collection and statistical studies.

The format for log presentation was established many years ago by the

American Petroleum Institute (API) in order that all of the service companies record similar electrical measurements on a standard width chart so that direct comparisons could be made of logs. In addition, log headings were standardized with pertinent information in the same order for every service company. In the absence of a better system, water well logs are usually presented in the same format. For electric logs, the standard log is 8¼ inches wide and has three vertical columns each 2½ inches wide divided into 10 divisions. The left hand column is separated from the other two by a ¾ inch column in which depths are recorded. The SP is recorded in the left hand track, the short and long normal resistivity curves are recorded in the center track and are differentiated by recording the long normal as a dotted trace. The far right column is used to record either a long lateral curve or a point resistance detail curve.

The Spontaneous Potential Curve

It should be understood that *potential* is just another term for voltage. Thus, a common flashlight cell generates a potential of 1.5 volts. Potentials of much smaller magnitude are encountered in the well bore. In fact, these potentials are so small that the volt is too large a unit for conveniently measuring them, so a much smaller unit called a millivolt is employed. A millivolt is 1/1000 of a volt or 0.001 volt. Figure II-1 shows a simplified SP circuit.

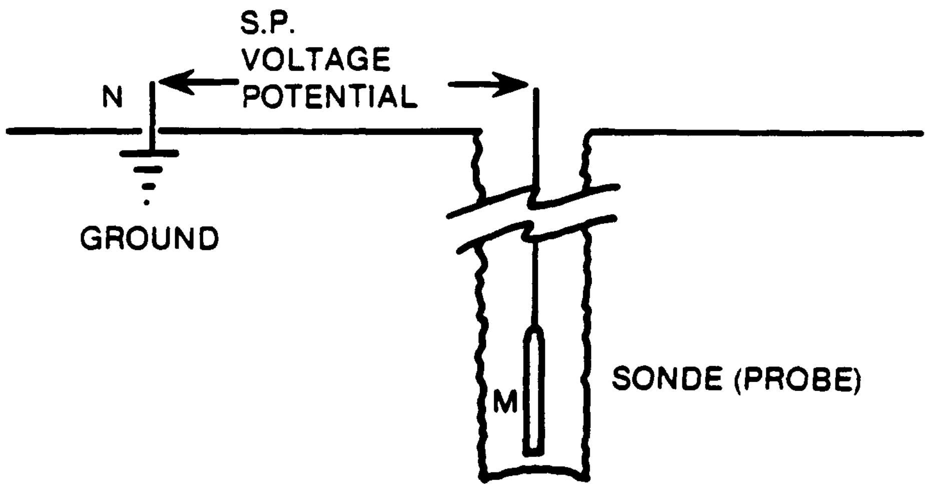


Figure II-1
Simplified S P Circuit

The SP is mainly used for geologic correlation, for finding bed thickness, for separating non-porous from porous beds in shale-sandstone and shale-carbonate sequences. There are three connected media needed to generate the SP; a permeable bed having water in the pores, a clay or shale bed, and a borehole filled with mud or water. Figure II-2 shows the current generated within the three media. II-2-A shows a condition where formation water is

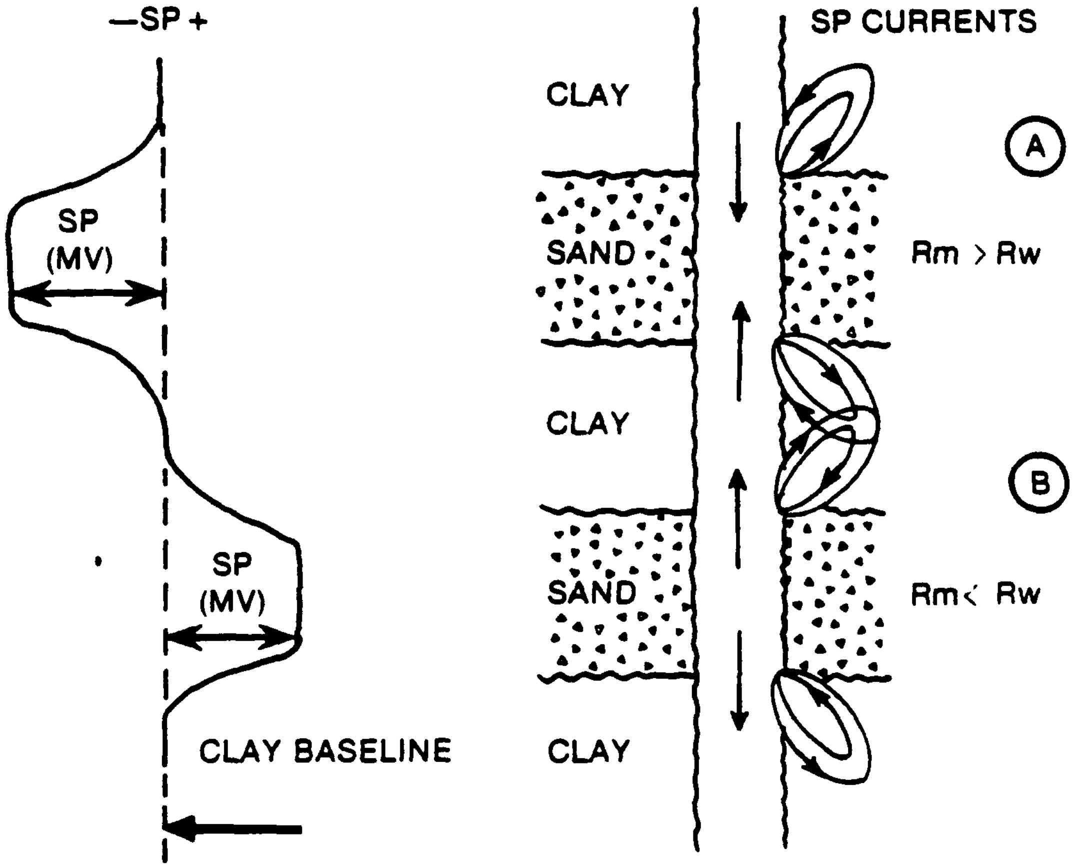


Figure II-2
Positive and Negative SP Curves Relative to Mud and Water Resistivities

less resistive (saltier) than the drilling mud. In II-2-B the formation water is more resistive (fresher) than the mud. The larger the resistivity difference, the larger the magnitude of the potential.

There are three methods by which potentials are spontaneously generated in mu.. filled holes. First, a potential can be generated by an electrolyte being forced under pressure through a pervious membrane, and is called a *streaming* potential. Second, a *liquid junction* potential is generated when two electrolytes with different concentrations and/or ions come in contact or are separated by a pervious membrane. The third, *shale* potential is generated by a diffusion mechanism.

Since streaming potentials are of little consequence in water wells, they will not be discussed here. Liquid junction potentials are generated when two electrolytes of different concentrations containing ions of different mobilities come in contact with each other or are separated by a pervious membrane. In the bore hole region these conditions exist. If the formation fluid is saltier than the fluid in the hole (mud or water), a normal occurrence, there will be an excess of ions in the formation fluid. Many of these ions, both positive and negative, will migrate or diffuse into the bore hole. Sodium chloride is normally the dominant chemical compound in solution. Both sodium ions and chloride ions have an electrical charge. The

charges are of equal magnitude but of opposite sign. Sodium ions are positive and chloride ions are negative. Chloride ions, having greater mobility than sodium ions, move faster. Thus, there will always be more chloride ions in the borehole than there will be sodium ions. The fluid in the hole in front of a porous, permeable formation, containing saltier fluid than is in the hole, will always have an excess of negative ions and therefore a potential which is also negative with respect to its surroundings.

Shale potentials also are generated by a diffusion mechanism. However, in this case, the shale acts as a selectively permeable membrane, allowing the slower moving sodium ions to pass through into the borehole while holding back the negative chloride ions by electrostatic repulsion. Therefore, the fluid in the hole in front of a shale section, containing saltier fluid than is in the hole, will always have an excess of positive ions and also a potential which is positive relative to its surroundings. It is these differences of potential opposite shales and adjacent permeable formations which are recorded as the SP curve. Like the liquid junction potential, the shale potential becomes greater with a greater contrast in resistivity between the water in the borehole and the water in the formation. The total potential recorded is the sum of the liquid junction and shale potentials. The liquid junction potential makes up about 17 percent of the actual observed value while the shale potential contributes the other 83 percent.

The SP curve can be used with the proper charts and formulae to calculate the formation water resistivity. Other information needed to do the calculations includes the resistivity and temperature of the mud, resistivity and temperature of the mud filtrate, and the formation temperature.

The amplitude of the SP curve is mainly affected by the bed thickness in relation to the borehole diameter and by the bed resistivity in relation to the borehole mud resistivity. As the ratio of bed thickness to borehole diameter increases, full potential development is achieved and called Static SP (SSP). As the ratio is reduced, a correction factor is needed. Also, when the ratio of bed resistivity to mud resistivity is high, a correction factor is needed. A low bed to mud resistivity will allow full SP deflection.

The ions contained in the solutions (mud and formation water) and their concentrations also affect the SP curve. The presence of the divalent cations magnesium and calcium (Mg^{++}, Ca^{++}) cause an SP that looks saltier than it really is.

The calculation of electrical conductivity (EC) and total dissolved solids (TDS) requires several measurements, the use of charts and curves, and most important of all, adaptation and refinement for each geographic area.

Water Quality Calculation from the SP

Using the example log in Figure II-3 and the *Salinity-Resistivity* chart in Figure II-4 along with some appropriate formulas, we can show one of the methods used in the determination of water quality:

1. Obtain a circulated mud sample just before the drill pipe is pulled from the well. Measure the resistivity and temperature of the mud sample. R_m = 32.6 @ 63° F.

2. Using the mud press, obtain a mud filtrate sample. Measure the resistivity and temperature of the filtrate. R_{mf} 32.6 @ 63° F.
3. Convert R_{mf} at the measured temperature to is value at 77° F. using the chart in Figure II-4. R_{mf} = 26.5 @ 77° F.
4. Determine R_{mfe} @ 77° F. $R_{mfe} = R_{mf}$ for NaCl muds. R_{mfe} = 0.85 R_{mf} for non-NaCl muds. This case is non-NaCl. R_{mfe} = 22.5 @ 77° F.
5. Determine the zones of interest from the electric log. In this case, we will study the sand just below 700 feet. SP = -6 MV.
6. For each zone of interest, determine R_{we} from the appropriate formula:

   NaCl mud and NaCl formation waters: $R_w = 10^{SP/70} \times R_{mf}$

   NcCl mud and non NaCl formation waters: $R_{we} = 10^{SP/70} \times R_{mf}$

   Non NaCl mud and non NaCl formation waters: $R_{we} = 10^{SP/70} \times R_{mfe}$

   $$R_{we} = 10^{SP/70} \times R_{mfe}$$
   $$= 10^{-6/70} \times 22.5$$
   $$= 18.5$$
7. Determine R_w @ 77° F.

   $R_w = R_{we}$ for NcCl formation waters

   $R_w = R_{we} \times 1.75$ for $NaHCO_3$ formation waters

   $R_w = 32.4$
8. Determine TDS @ 77° F. with the following formula:

   TDS in PPM = K/R_w Where K = 12,000 for $Ca(HCO_3)2$ solutions

   K = 10,000 for $NaHCO_3$ solutions

   K = 6,700 for $MgSO_4$ solutions

   K = 5,300 for NaCl solutions

   K = 4,200 for $MgCl_2$ solutions

   TDS in PPM = 10,000/32.4

Since nature is never simple, we need to constantly upgrade our methods of interpretation by the inclusion of more and more information from nearby wells. You can see from the above formulae that a knowledge of ionic assemblages is essential to accurate interpretation. A laboratory analysis should be obtained of water from each completed well. The cost is very reasonable and will help the log analyst immeasurably in plotting geographical distributions.

The Resistivity Curves

Resistance is the opposition offered by a body to the passage of an electrical current through it. The unit of measurement is the *ohm*, and a body has a resistance of one ohm when a potential of one volt across it causes one ampere of current to flow.

Resistance is directly proportional to length (as the length is increased or decreased, the resistance is changed the same amount). On the other hand resistance is inversely proportional to cross sectional area (as the cross sectional area decreases, the resistance increases). Another term used in logging is *resistivity*, and it is a material's resistance per unit volume. The units of resistivity are ohm-meters squared per meter.

Unlike resistance, resistivity is not merely a characteristic of some

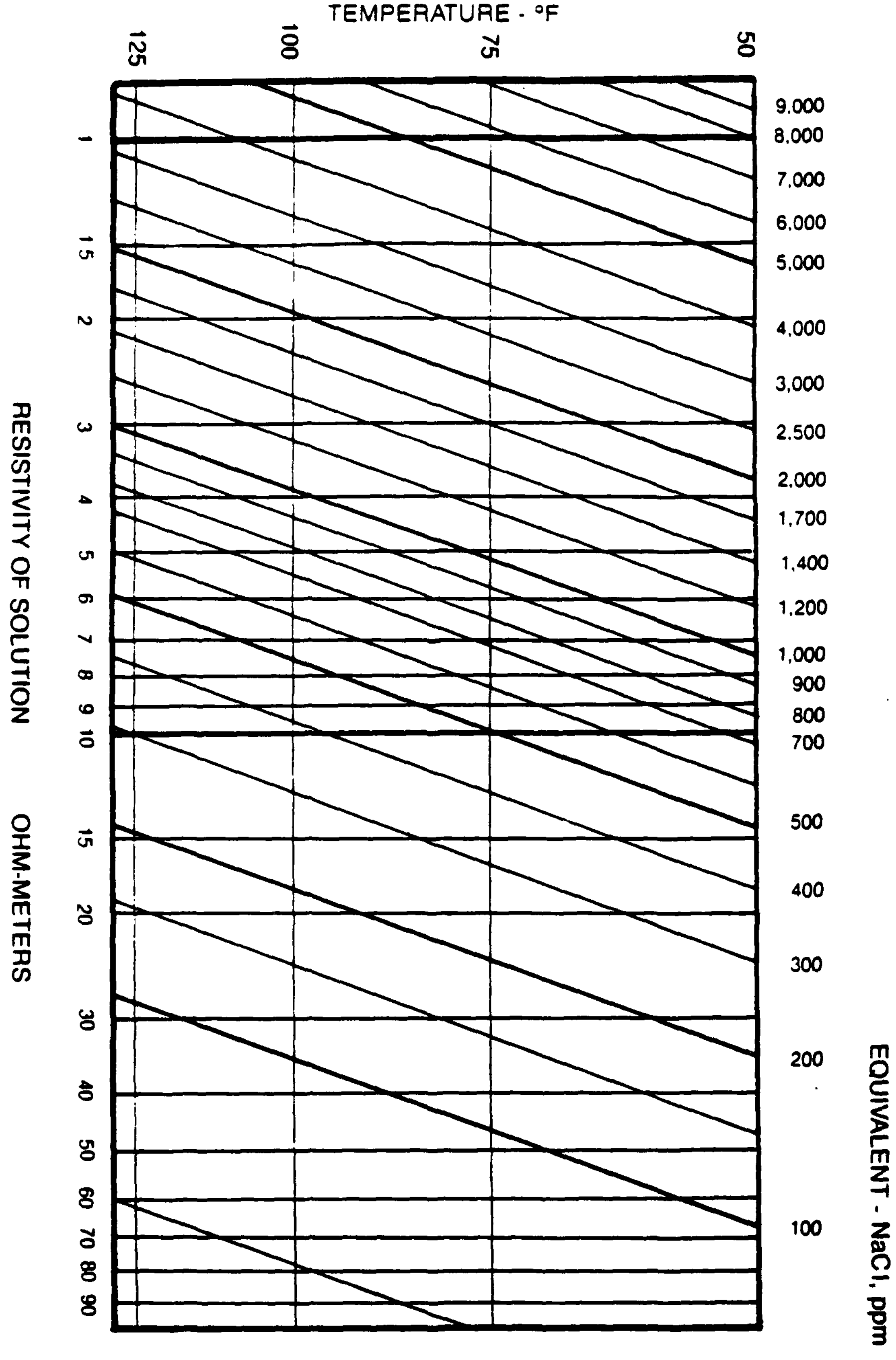


Figure II-4
Salinity - Resistivity - Fresh Waters

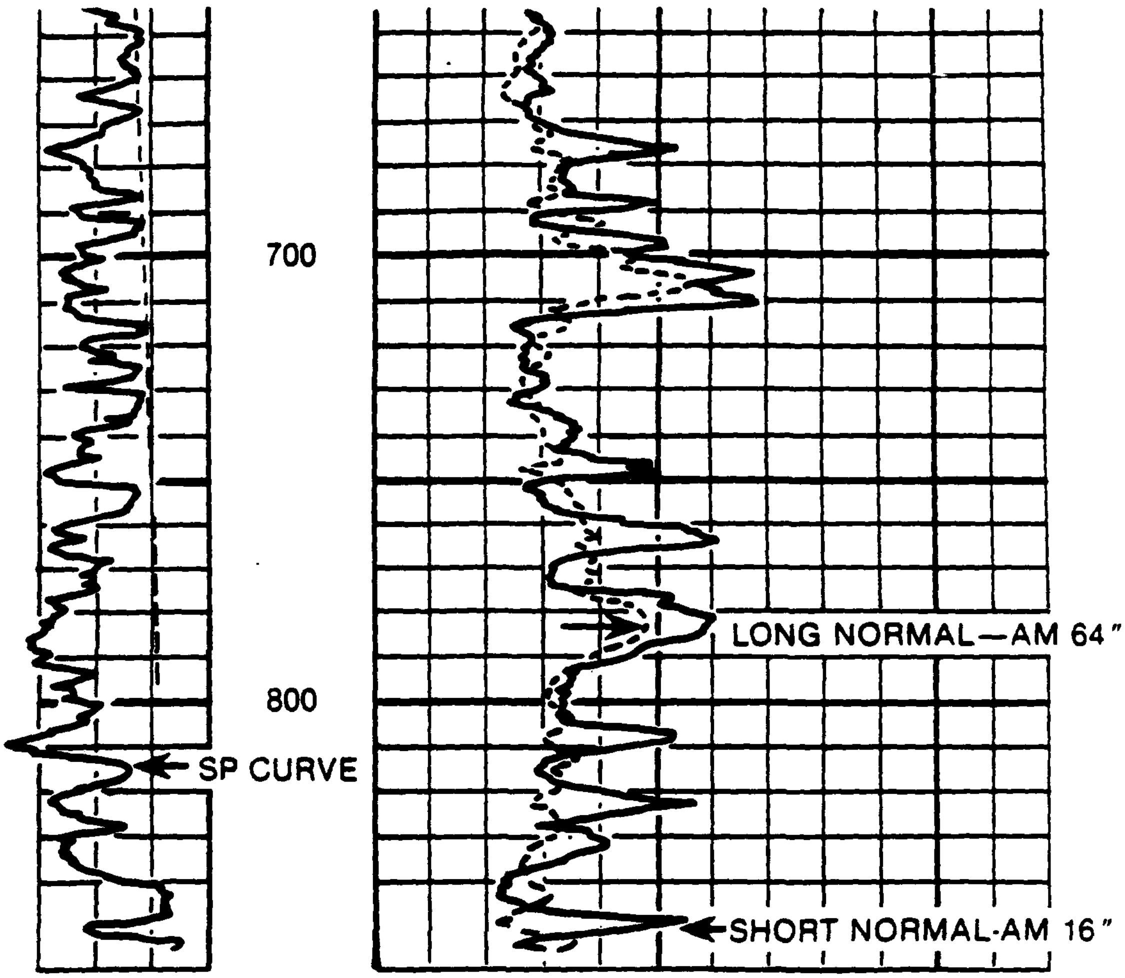


Figure II-3
Example - SP Curve Used For Water Quality Calculation

particular piece of a material, but is one of its basic physical properties, and is true of all pieces of that material at a given temperature and pressure.

All rock formations conduct electricity to a greater or lesser extent. Electrical conductivity is a measure of the ability of rocks to conduct electricity. Resistivity, on the other hand, measures the ability of rocks to oppose the flow of electricity. In fact, resistivity is the reciprocal of conductivity.

Unlike metallic conductivity (by electron flow) or semi-conductor conductivity (by electrons and holes), rock conductivity is due to the presence of ions of salt dissolved in the water filling the pore spaces of the rocks. Water samples containing dissolved salts are called solutions and we are mainly concerned with the electrolytic conductivity of solutions. The larger the ionic content, the larger the conductivity and, conversely, the smaller the resistivity. It is to be noted that perfectly pure distilled water is not a conductor at all; instead, it is a perfect insulator. Such a situation does not conform to reality since the purest waters contain at least traces of dissolved salts, which make them slightly conductive.

Table II-1
Typical Resistivities For Various Electrolytes

Electrolyte	Resistivity (ohm-Meters)
Brine	.04
Brackish water	.2 to .5
Sea Water	.2
Drilling mud	.04 to 5.00
Tap water	7 to 15
Distilled water	several hundred ohms

The conductivity of an electrolyte is, among other things which can be neglected for the time being, a function of two factors:

1. The salt concentration in the solution, that is the amount of dissolved salt in parts per million (ppm), or grains per gallon, etc.; the higher the concentration, the higher the conductivity.
2. The nature of the salt, or the nature of the ions; some ions being better conductors than others.

Figure II-5 indicates the conductivity of various salt solutions versus concentrations.

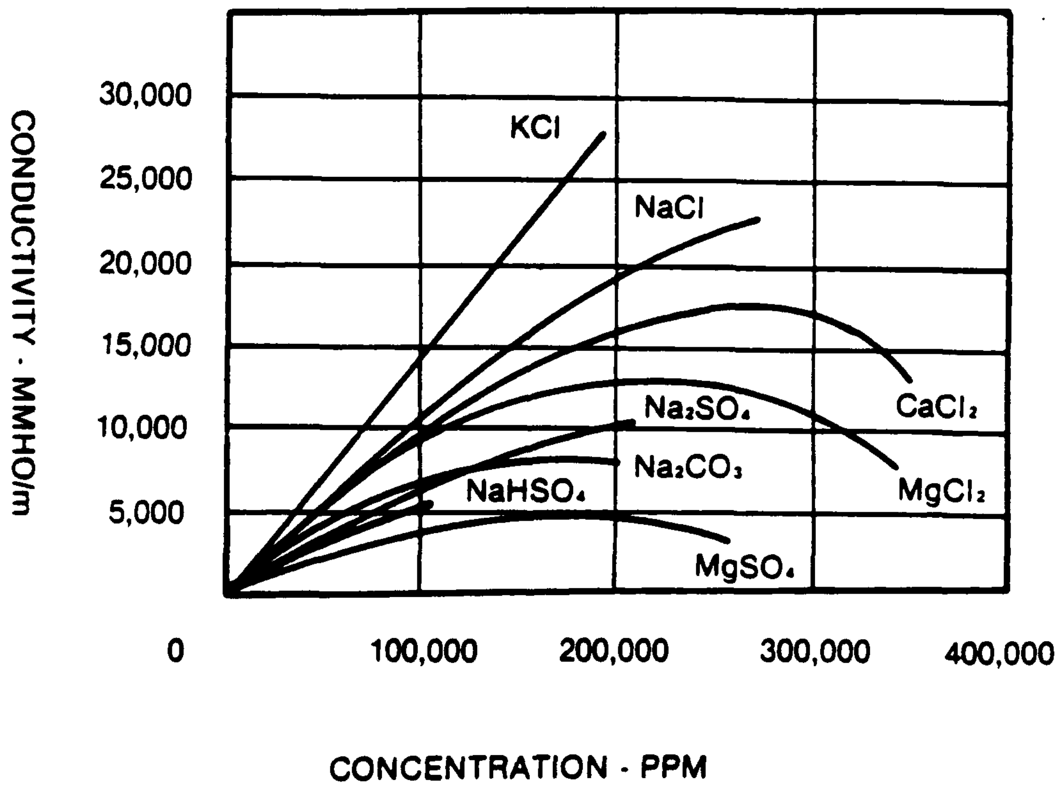


Figure II-5
Conductivity Versus Concentration For Salt Solutions at 18 C

Temperature also affects the resistivity of electrolytes. As the temperature increases, the resistivity of the electrolyte decreases. The chart of Figure II-4 indicates the magnitude of resistivity variations for sodium chloride solutions under variations in solution temperature. This chart also indicates the ion concentrations in parts per million (ppm).

Some rocks will conduct electricity through the interconnecting pore channels filled with formation water, which is an electrolytic solution and, therefore, is a conductive medium. In most cases of interest (shaly or clayey sands are the exceptions), the matrix surrounding the pores is non-conductive. The conductivity of a given volume of formation will be lower than that of an equal volume of the same water only. By the same token, an identical volume of pure matrix (no water) would have no conductivity (or infinite resistivity).

The early method of logging made use of a single monoelectrode probe, Figure II-6-A. An electric current was fed from the surface to the electrode. This current then spread from the electrode into the formation, returning to the surface and back to the current generator through a surface electrode return (a mud pit electrode, a casing clamp, a stake planted in the ground, etc.). The main shortcoming of the monoelectrode was the lack of depth of investigation. Very broadly, half of the measurement originates from a spherical shell which has a thickness equal to the radius of the electrode. It is obvious that this type of measurement will be highly influenced by the mud in the borehole. For this reason, this system has been superseded by the multi-electrode system.

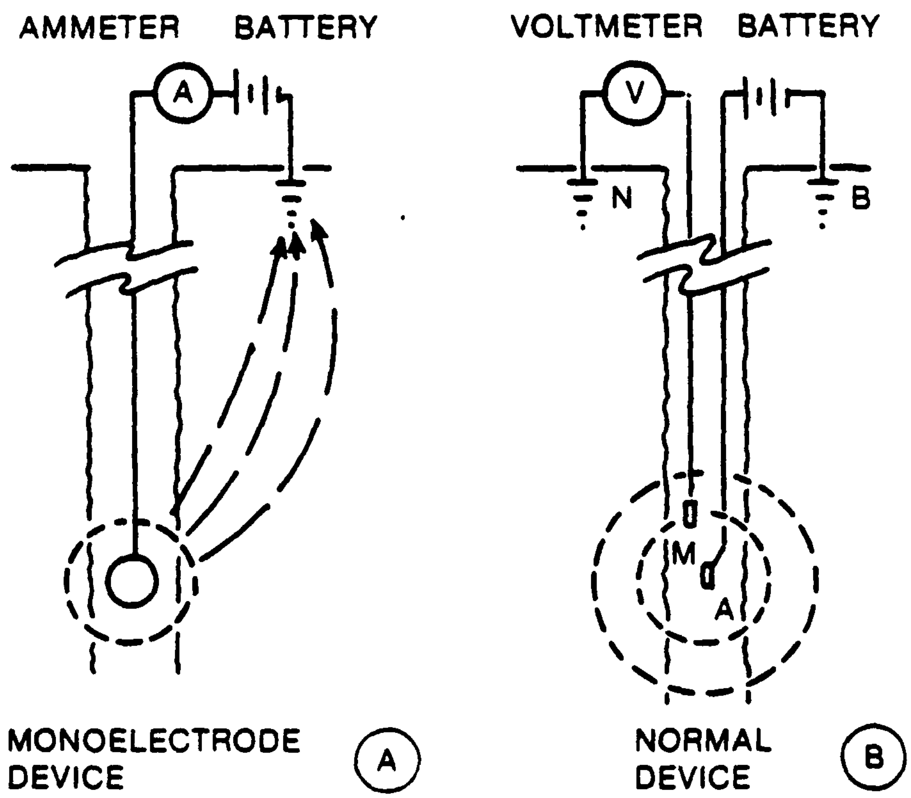


Figure II-6-A, B
Comparison — Monoelectrode Versus Normal Devices

The *normal device* is a two electrode system as shown in Figure II-6-B. Electrode A is a current emitting electrode and electrode M is a voltage potential measurement electrode. Surface electrodes B and N are current return and voltage reference electrodes respectively.

Calling: VM . . . . . . Electrode M potential in Volts
P . . . . Formation Resistivity in Ohm-Meters
I . . . . Electrode A Current in Amperes
AM . . . . . . Spacing (Distance AM) in Meters

Then,

$$VM = \frac{I}{4 \times 3.14 \times AM} X \; P$$

We see that if I is constant, VM is proportional to P (AM is obviously constant) and that the measurement consists of continuously recording the voltage VM which varies in proportion to the resistivity P.

The depth of investigation of a normal device is equivalent to that of a large monoelectrode of radius AM. It is easily seen that by the use of two electrodes, the depth of investigation has been largely increased.

In actual practice, the cable armor is used for the current return B. The reason for this is to eliminate the noise pickup on the conductor carrying the signal potential of M (VM), this noise being generated by the alternating current fed to A by mutual induction between conductors.

Figure II-7 shows the depth of investigation of the normal device, and the variation of the measured voltage in terms of distance from the probe, the unit of distance being the spacing itself. Fifty per cent of the measured voltage originates in a shell of formation thickness 2AM, 75 per cent in a shell of thickness 4AM. As we go further away from the probe, the voltage diminishes considerably while the contribution of the formation to the signal voltage diminishes more and more. This means one thing, the probe collects most of its signal from a region close to the probe and practically no signal from regions remote.

This makes electric logging possible. If the signal did not decrease so rapidly as the distance increases, the measurement would be influenced by many factors such as casing, unconformities, etc. A *confined* measurement is really what is needed.

To investigate deep into formations we must sacrifice detail for depth penetration, because we average the resistivities in the vicinity of the A and M electrodes. It is the distance between current electrode A and potential electrode M (the AM spacing) that determines the penetration of the normal resistivity measurement. The longer this distance, the deeper the investigation into the formation, and the poorer the *detail* afforded. When we refer to 16-inch and 64-inch normal resistivity curves it is this type of electrode arrangement that is meant, and the 16-inch and 64-inch figures refer to AM spacings of 16 inches and 64 inches. The effective point of the measurement for the normal device is midway between the current electrode A and the potential electrode M.

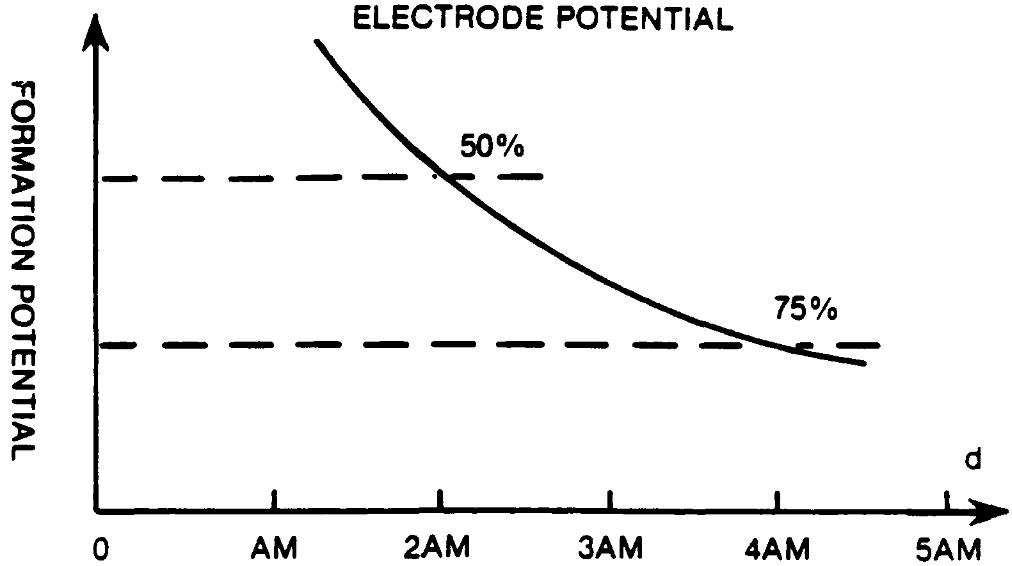


Figure II-7
Depth of Investigation of Normal Device

There are two general types of resistivity curves employed in electric logging; those of shallow penetration and those of deep penetration.

Curves of shallow penetration are those that measure, predominantly, the resistivity of the zone near the bore hole. This zone has, in varying degrees, some of its natural fluid displaced; as water or mud filtrate from the bore is forced into it by the pressure of drilling or by the weight of the fluid column. For this reason it is known as the *invaded zone*. Many factors influence the invasion process.

Since non-fractured shale has no permeability, there is no invasion in most shale beds, and resistivities are the same in uniform shales at any distance from the bore hole. Although the resistivities of hard non-porous beds are vastly different from those of shales, these beds are also uninvaded, and if they are uniform, their resistivities remain the same at any distance from the bore hole.

In permeable beds drilled with rotary tools using drilling mud, the porosity affects the depth the invaded zone extends from the bore hole. The shallowest invasion occurs in the highest porosities, and the deepest invasion in the lowest porosities.

Although there are specialized and complex penetration curves for measuring the resistivity of the invaded zone, the one most used is the 16-inch normal resistivity curve. The 16-inch curve is shown on the electric log graph as the solid curve in the center column. It is calibrated so that the right-hand edge of the depth-marking column represents 0 ohm M^2/M and resistivity increases with increasing deflection to the right.

Curves of deep penetration are those that measure, predominantly, the resistivity of a zone further away from the bore hole, and except for deep invasion, a zone largely beyond the invaded zone where conditions are still as they were before the well was drilled. The resistivity of the uninvaded zone is shown as the *true resistivity* of the bed. The true resistivity is useful

in estimating the type and relative quantities of fluids contained in the pore space.

As was the case with shallow penetration curves, there are specialized and complex deep penetration curves for measuring or deriving true resistivity, but the one most used is the 64-inch normal resistivity curve. The 64-inch curve is shown on the electric log graph as the dotted curve in the center column. It is calibrated in exactly the same manner as the 16-inch normal resistivity curve and uses the same scale markings.

In rock with no continuous path of pore space through the rock, called non-connected porosity, the resistivity of the fluid does not greatly affect the total resistivity. Instead, the rock surrounding the fluid is the major influence on the resistivity reading that we get. The situation is equivalent to a current going through a series of resistors, and the total resistance is the sum of the separate resistances. With the standard electric log alone, we cannot distinguish between zero porosity and non-connected porosity.

The thickness of the bed we attempt to measure, also has a pronounced affect on the accuracy of the results. The amount of inaccuracy is dependent upon the comparison between the probe spacing and the bed thickness. When a resistive bed is thinner than the spacing of the normal device and is surrounded by beds of low resistivity, it will be recorded on the

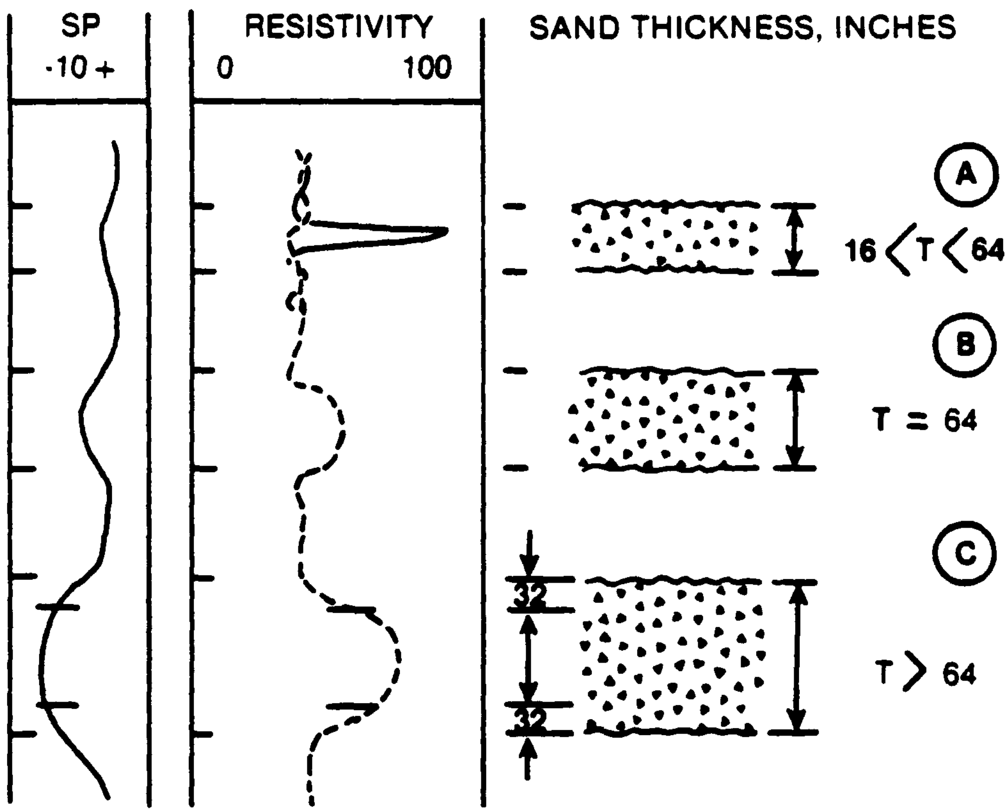


Figure II-8 A, B and C.
Examples - Bed Thickness.I, Versus Electrode Spacing For Normal Device, AM = 64 Inches

log as low resistivity. If this thin, resistive bed is between two low-resistivity shale beds, this erronious value will be even less than the resistivity of the shales. This phenomenon is known simply as a *reversal*. This can be illustrated by showing a highly-resistive bed thicker than the 16-inch short normal spacing, but thinner than the 64-inch long normal spacing. Under this condition the 64-inch resistivity curve will reverse and falsely indicate a low resistivity, since the bed is thinner than its spacing. This example is pictured in Figure II- 8 -A.

When the thickness of a bed is equal to the spacing, the recording is almost flat and the bed is said to be of critical thickness. See Figure II- 8 -B.

If a bed had a thickness many times the spacing, the value recorded follows the pattern of the *regular* response. Normal resistivity curves always show resistive beds thinner than they actually are by an amount equal to the spacing. Half of this error is at the top boundary. This effect is pictured in Figure II- 8 -C.

Lateral Curve

With the lateral device we can measure the resistivity of the formation further from the hole than by the normal devices. The distance depends on the spacing of the electrodes. The lateral tool is a 3-electrode device (see Figure II- 9) comprised of two voltage measuring electrodes (M, N) and a current electrode (A). The two voltage measuring electrodes are close to each other but remotely located from the current electrode.

The effective measuring point of the lateral device is midway between the potential electrodes M and N and is labled O. The nominal spacing of the device is the distance from this midpoint O, to current electrode A and is called the AO spacing. Electric logs which include a lateral curve indicate the AO spacing on the log heading. Common AO spacings are in the neighborhood of 15 feet.

The lateral device measures the resistivity of a small volume of material far out in the formation without involving the material nearer the borehole, as the normal devices do. The dashed circle shows the *equipotential sphere* the tool measures. There are some particular responses that show up on the lateral logs. The following is an explanation of the responses.

First, in a thick resistive bed (several times the AO spacing) between two beds of low resistivity a response as in Figure II- 10-A occurs. As electrode A leaves the bed, a part of the resistive bed equal to the AO spacing is falsely indicated as having a low resistivity. From the bottom of this interval to the bottom of the bed, the resistivity indication increases to a value which is greater than the true resistivity. A good procedure for picking the true resistivity (R_T) from the lateral curve in thick, resistive beds is to choose the indicated value as shown in Figure II- 10-A. It is to be noted that the lateral resistivity curve is not symmetrical, whereas the normal curves have symmetry.

As we make the resistive bed thinner, the peak deflection of the lateral curve exceeds the true resistivity by less and less, until when the bed thickness is 1½ times the AO spacing, the true resistivity may be chosen as the indication at a point 2/3 of the distance out on the slope, below a

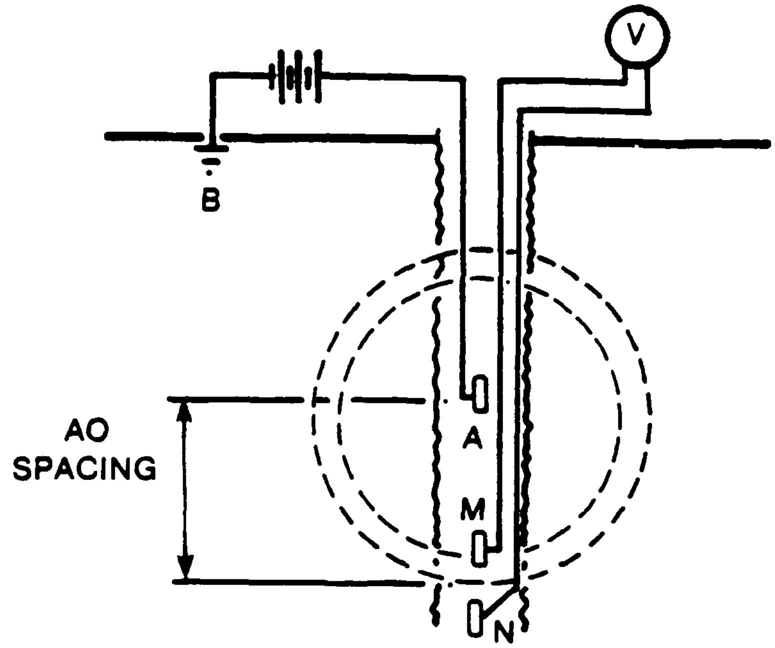


Figure II-9
Schematic Lateral Device

distance AO from the top of the bed. This choice is illustrated in Figure II-10-B.

When the bed thickness decreases to 1⅓ times the AO spacing, the peak response may be chosen as the true resistivity. Figure II-10-C shows this case. When the bed thickness reaches the AO spacing, the lateral device has its minimum response. Although the true resistivity can only be guessed at this *critical thickness*, the indication of the graph is likely about ¼ to ⅓ of the true resistivity. The response of the lateral device to a bed of critical thickness (thickness = AO) is shown in Figure II-10-D.

As the bed becomes thinner than the AP spacing, unlike the normal, the indicated resistivity from the lateral device increases, although the apparent resistivity never again reaches the true resistivity. With bed thicknesses of ¼ to ½ the AO spacing, the true resistivity is estimated by multiplying the peak value (R_{MAX}) in the bed by the resistivity of the adjacent shale (R_S) and dividing this product ($R_{MAX} \times R_S$) by the minimum value (R_{MIN}) below the thin bed. Figure II-10-E illustrates this procedure.

Several more peculiarities of the lateral device must be mentioned. Below beds which are thinner than the AO spacing, the lateral device falsely indicates a very low resistivity for a distance below the bed equal to the difference between the AO spacing and the bed thickness (AO – bed thickness). Because the lateral is incapable of indicating any high resistivities in this zone even if they exist, this zone is known as the *blind or dead zone*.

Another interesting phenomenon manifests itself below these beds, which are thinner than the AO spacing. At the botton of the dead zone, when the current electrode A is entering the top of the thin, resistive bed above, the resistivity indication begins to increase, and it continues to increase until

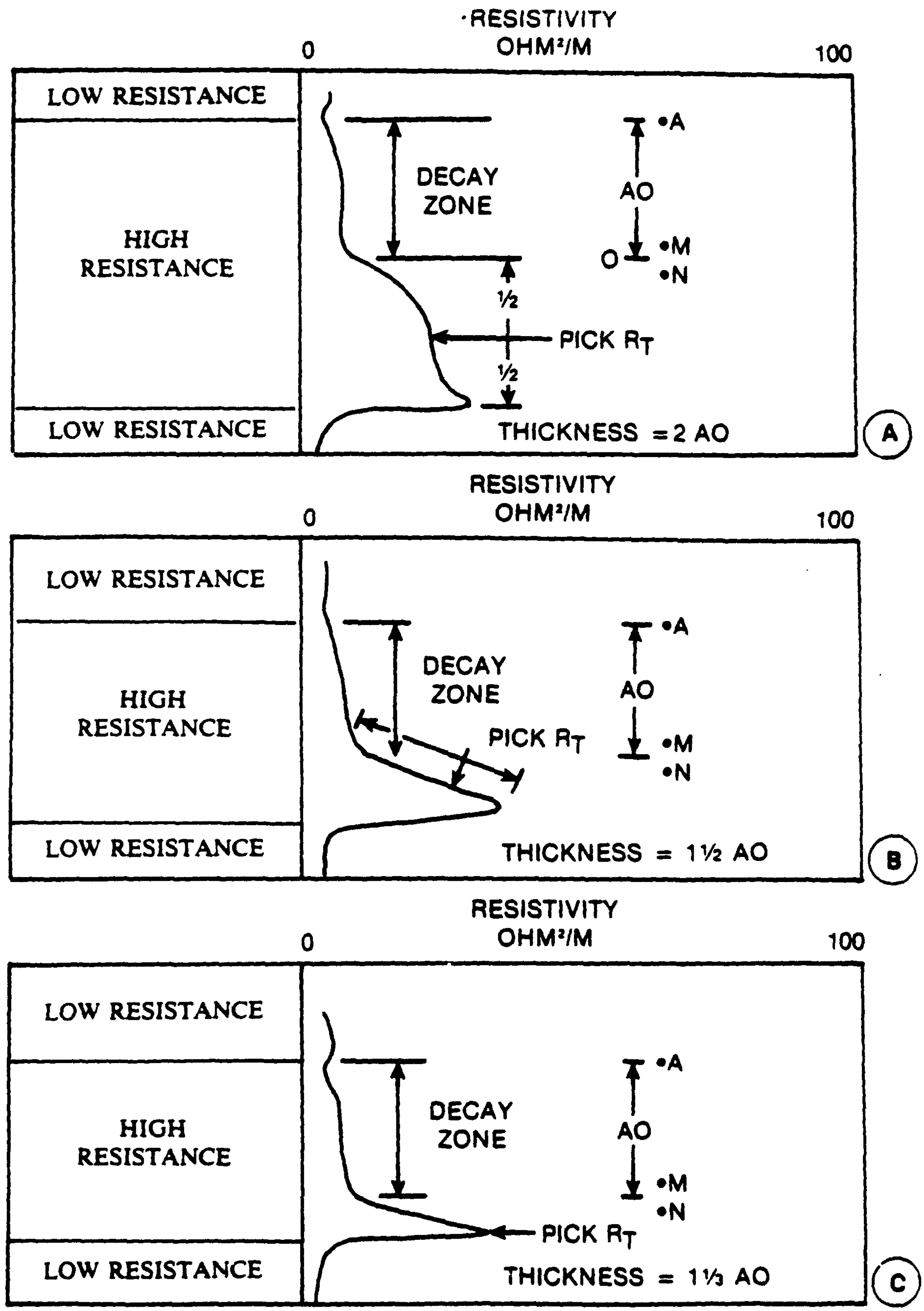


Figure II-10 - A, B and C
Example Bed Thickness
Versus Electrode Spacings
For Lateral Device

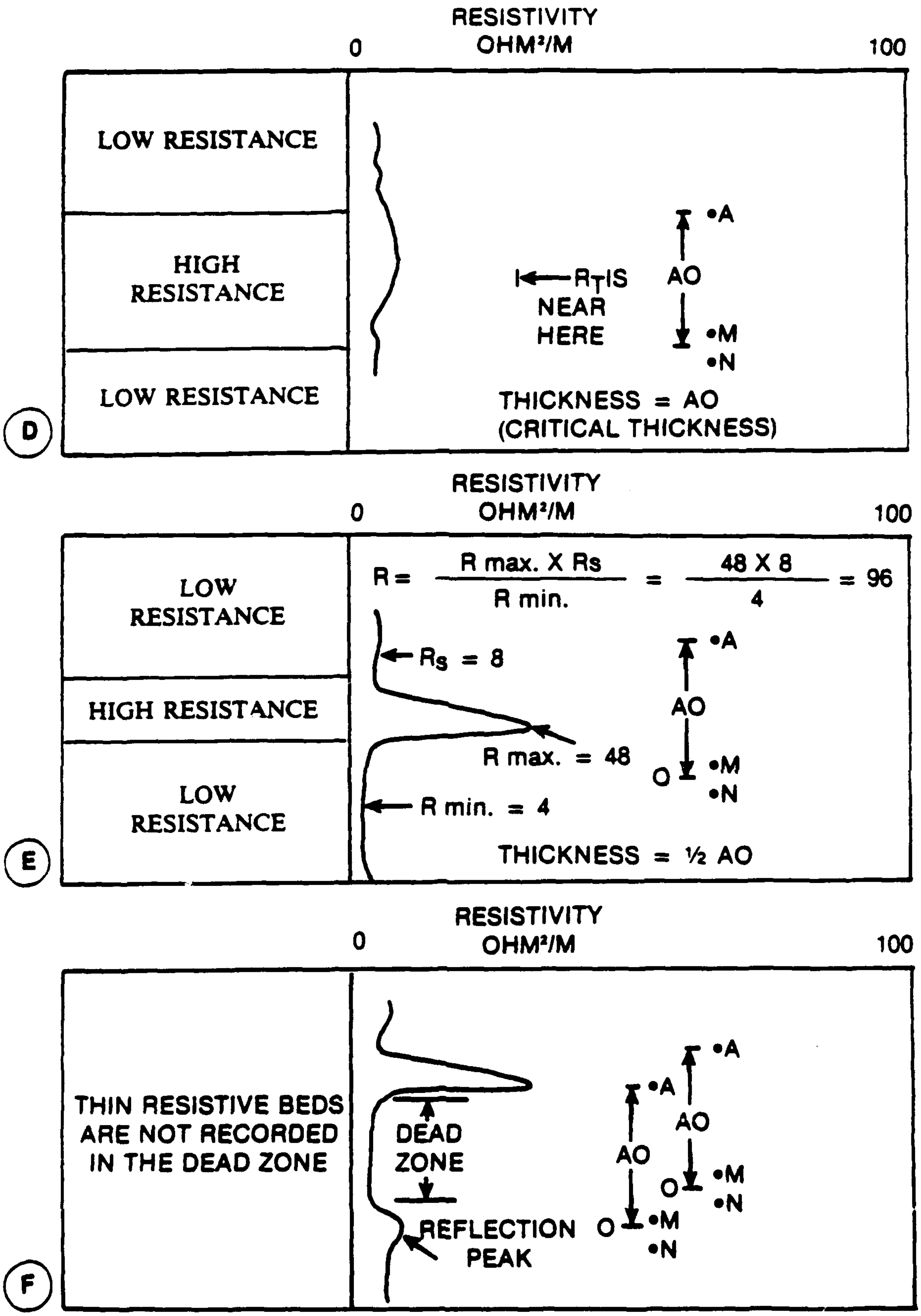


Figure II-10 - D, E and F
Example Bed Thickness
Versus Electrode Spacings
For Lateral Device

current electrode A leaves the bottom of the thin resistive bed above. This increase in indicated resistivity does not necessarily represent a formation resistivity change but is caused by the current electrode A passing through the thin resistive bed above. This false indication of increased resistivity is known as the *reflection peak*. Figure II-10-F points out these peculiarities.

We have shown that the lateral resistivity curve, even in homogeneous beds, has some peculiar responses. In sequences of beds and heterogeneous beds, the response may become so confusing as to be of little value.

Although, as mentioned, the lateral curve is often confusing and sometimes worthless, it does have several advantages. In extremely thick beds, it yields a relatively uninvaded value of true resistivity and, also for this reason, it is useful in estimating the extent of invasion existent in the long normal curve. Since the lateral does not reverse in thin beds, it permits an estimate of true resistivity of those beds.

Induction Electric Log (IEL)

The Induction Electric Log measures conductivity from alternating currents that are induced into the formation. It is very accurate for medium to low resistivity values (less than 50 ohm-meters) and where the ratio of resistivity of the mud filtrate to the resistivity of the formation water is 2.5 or greater. The IEL produces its best results in medium to high porosity formations drilled with fresh mud, or air drilled (dry) holes.

The induction device measures conductivity rather than resistivity. Conductivity and resistivity are mathematically related as follows:

$$C = \frac{1000}{R} \quad \text{or} \quad R = \frac{1000}{C}$$

Where: C is conductivity in millimhos/meter and R is resistivity in ohm-meters.

Since most people who work with logs are more familiar with resistivity measurements, the conductivity measurement of the induction tool is put through an electronic reciprocator and converted to a resistivity curve on the log. This along with the short normal and SP curves are then displayed. The most common format for displaying the IEL has recently changed so that the resistivity curves are recorded on a logarithmic scale.

Figure II-11 is a simplified depiction of an induction logging device. An oscillator supplies alternating current to the transmitter coil at D. This in turn creates an alternating field which creates current in a ground loop surrounding the well bore. This alternating current B then creates a field C around the imaginary ground loop which induces a voltage at the receiver coil E. The amount of voltage induced in the receiver coil is a function of the conductivity of the ground loop. If the formation material of which the ground loop is made has low conductivity, there will be less voltage induced in the receiver coil. The receiver response can then be calibrated to give conductivity figures for the formation through which the induction device is moved.

Electrodes A and M are used to record a 16 inch Normal Curve and an S.P. Curve at the same time the induction curve is being run.

Actual induction logging devices have more coils than depicted in order

to more precisely focus the voltages that reach the receiver coils. A common configuration is one that has a total of six coils with a radius of investigation of 40 inches.

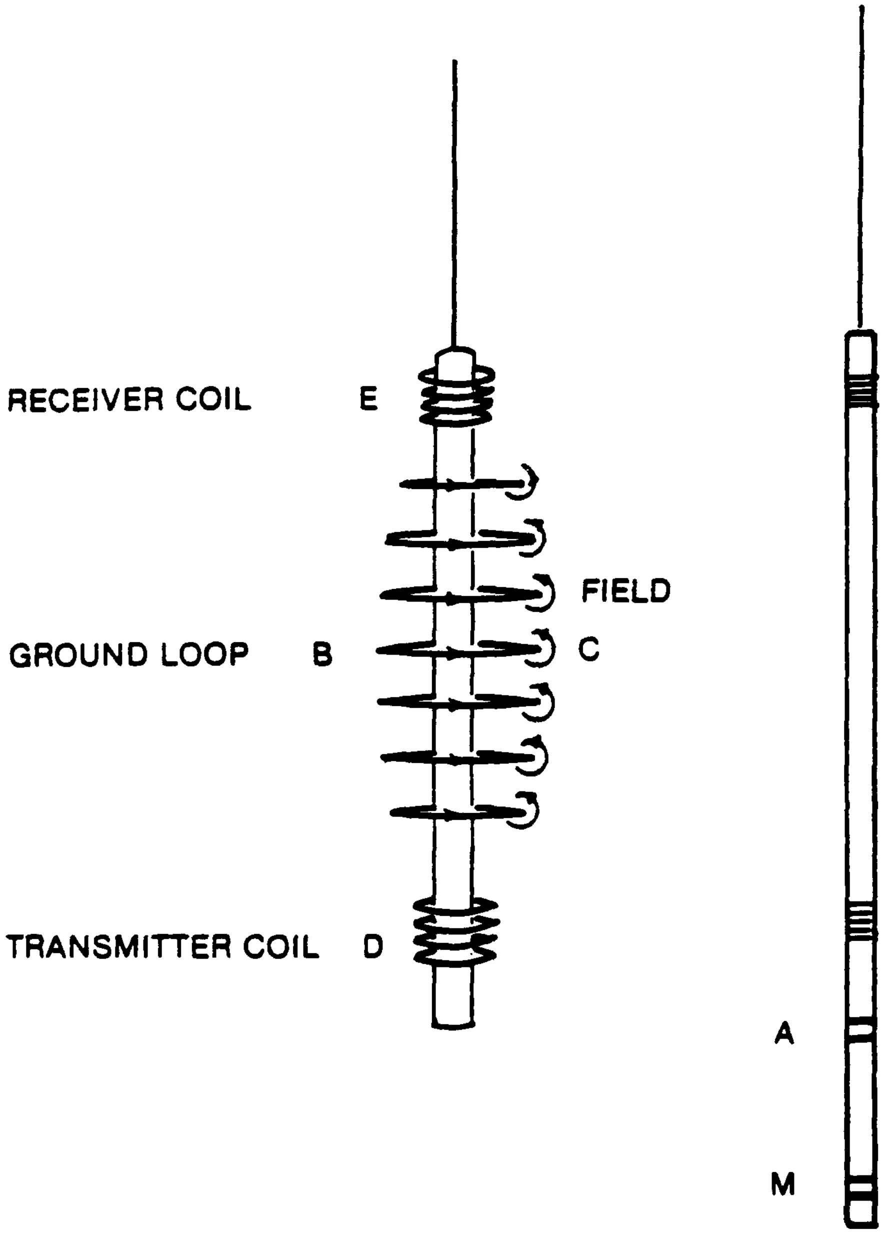


Figure II-11
Schematic-Induction Logging Device

3

NUCLEAR LOGGING

Nuclear logs are related to the measurement of fundamental particles or radiations from the nucleus of an atom. The most common logs are natural gamma ray, neutron and gamma-gamma or density logs. Nuclear logs may be run in a variety of downhole environments in either open holes or cased holes.

Since the radiation measured in nuclear logs is random in nature, minor fluctuations are present on all logs, and the logs will not repeat exactly. Repeat logging runs are a positive means of separating random changes from deflections related to lithology. Figure III-1 shows a combination gamma ray-neutron tool that may be used to record either log separately or both logs simultaneously. Also shown is a density tool of the type commonly used in water and mineral exploration.

Gamma Ray Log

Gamma ray logs measure the naturally occurring gamma emissions from the formation surrounding the borehole. These emissions are electromagnetic radiations that are released by a nuclei of an unstable element, decaying to a more stable state. In nature, the most significant of these elements occurring in abundance is potassium 40 (K40), uranium 238 (U238), uranium 235 (U235) and thorium 232 (TH232). The most plentiful of these elements is potassium 40.

As the unstable element decays, issuing electromagnetic radiation, the gamma ray probe detects the events by recording the number of particles or photon emissions. This detection is accomplished by use of a sodium iodide crystal optically coupled to a photomultiplier. As the incident photon enters the crystal a release of energy takes place in the form of illumination that is detected by the photomultiplier. A corresponding voltage is delivered to the surface where it is counted and averaged over a specific time period. Since radiation is of a statistical nature it is necessary to average the measurement of radiation over a selectable time period in order to derive a representative sample of the amount of radiation being emitted.

The greater the counting rate the more events the gamma detector is measuring, which in turn corresponds to the greater amount of an unstable element present in the formation. As mentioned, potassium 40 is by far the most abundant of these elements found in rock strata. K40 is found in all potassium bearing minerals such as potassium feldspars, biotite, orthoclase and several clay minerals rendering detection of these minerals via the

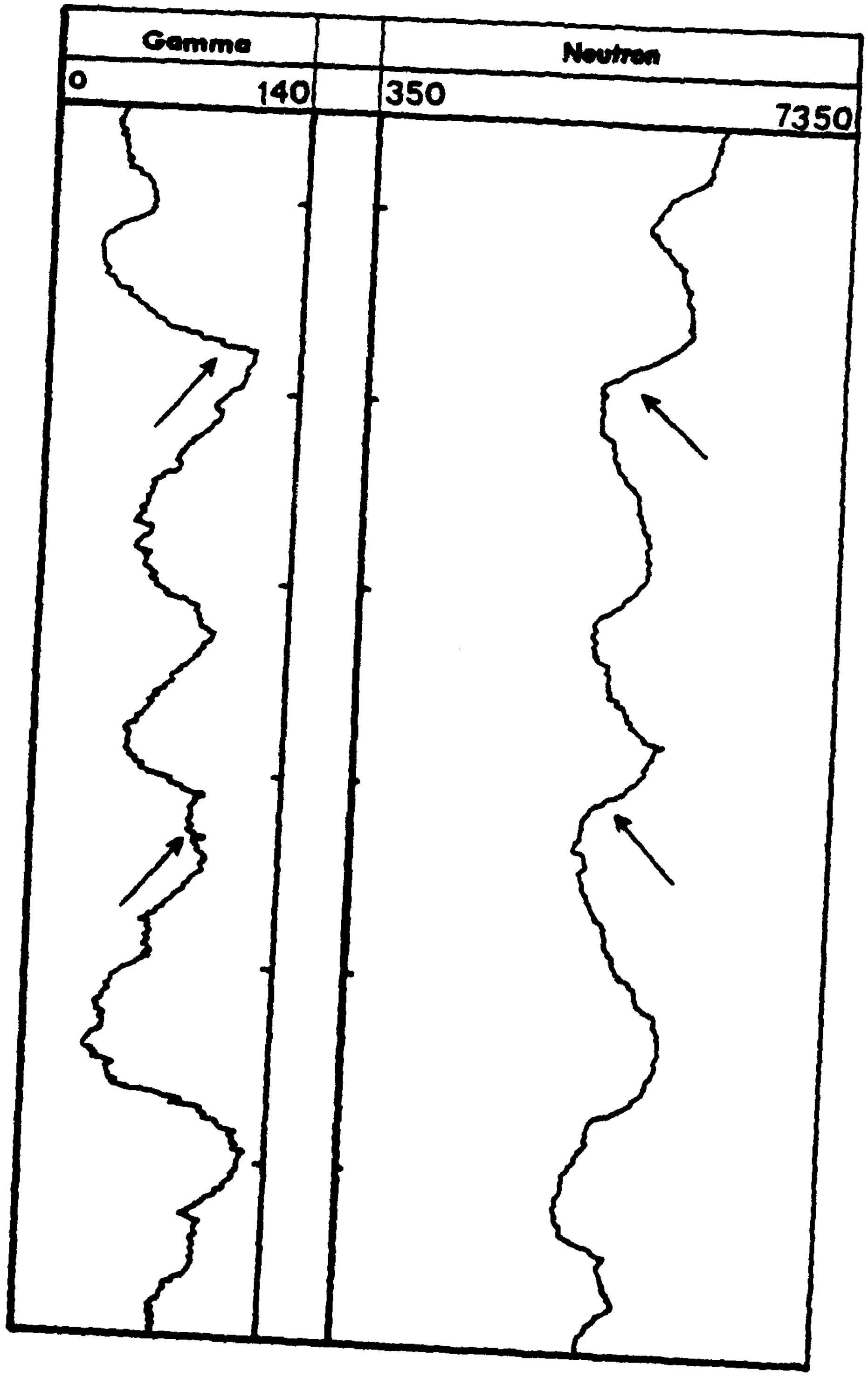


Figure III-1
Gamma-Neutron Log Showing Upward Fining

gamma ray log. Consequently, as the content of these minerals increases within the rock strata the response of the gamma ray probe increases. Inversely, as the content of the clay minerals decreases the response of the gamma ray probe decreases. Gamma ray logs show decreasing strengths from shales and clays, to siltstones, to sandy siltstones, to clean sandstones and gravels.

Dependent on how clay is present within the quartz matrix, as dispersed particles, structural grains, or as laminations, both porosity and permeability of the rock will be affected. To arrive at accurate porosity readings one must know the fraction of clay volume to total rock volume.

Clay fraction = Clay volume/Total rock volume

The gamma ray log is often used to determine fraction of clay, when clay minerals contribute to a significant response on the log. An example mineral is illite. The formula for deriving clay fraction is:

Clay fraction = (GR - GRcl) / (GRs - GRcl)

Where: GR = the zone of interest
GRcl = clay bed
GRs = clean sand bed

A word of caution with regards to calibrating the log response, when the area of interest is near a clay bed, is the assumption that the area of interest contains the same clay minerals. While potassium and thorium are considered good clay indicators, uranium may be present in the rock strata that contains no clay, causing a false indication. Montmorillonite has little or no gamma ray response.

When gamma active clays are present, a gamma ray log can be useful in revealing stratigraphic development. Figure III-1 displays a sloping gamma response that is corresponding to changes in grain sizes. The fining trend is upwards. This log response can be revealing and easily identified.

When logging in metamorphic and igneous rocks of low porosity, the gamma ray response is dependent on the minerals within the rock. The one exception being along open, water bearing fractures where high gamma activity is recorded. This response is derived normally from either uranium becoming water soluble under acidic conditions, or the alteration of the host rock by water movement that has precipitated radioactive enriched minerals along the fracture wall.

Because the gamma ray log is a passive measurement of naturally occurring radioactive elements, and being lithologically dependent, it is an excellent correlation log. Gamma ray logs are normally run with all porosity tools and with an electric log when SP response lacks definition.

The vertical resolution of the gamma ray probe is a function of counting rate, time constant and logging speed. When all three are at optimum settings the vertical resolution is approximately one foot. Because of the statistical nature of radiation emission, repeatability of the log is not exact with respect to statistical variation of the counts. For this reason, the log will show repeatability in the shape of the curve but the individual curve peaks may be slightly different.

Since the energy of gamma emission is inversely proportional to distance,

the greater the borehole diameter the less effective the gamma ray log response. Gamma ray logs can be run in gas filled holes of either open or cased wells.

4

CALIPER LOGGING

Although they are not regularly run on water wells, caliper logs have many useful applications in both open and cased holes.

Caliper logs measure the average diameter of drilled holes by the use of two or more arms which are mechanically linked to a precision potentiometer that biases an electronic circuit within the tool body. Changes in hole diameter are converted to pulses that are transmitted to the surface for recording. Logs are usually presented as a single trace that displays the average hole diameter in inches.

When run with an electric or nuclear log, the caliper is very useful as an interpretive aid in substantiating the differences in log readouts that result from hole diameter effects rather than from lithologic changes. Most logs that respond to lithology are also affected by changes in hole diameter. On all charts used for log interpretation, hole size must be known in order to arrive at proper quantitative values.

A caliper log can be used to determine quite accurately the proper amount of gravel needed to fill the annular space between the casing and the borehole wall. Figure IV-1 is the log of a well in which a great deal of formation washout was experienced during the reverse drilling of a 28 inch hole, until at a depth of 600 feet it was deemed necessary to add mud in order to stabilize the hole. With the exception of a 30 foot zone below 900 feet, the hole remained fairly true to gauge for the balance of the drilling, even showing some undersize hole where mud cake built up across some permeable zones. Calculations of the gravel required to fill the annular space showed that an excess of 20% more gravel would be required to fill the annulus than would be expected without benefit of the log. A caliper log is also essential for selecting seats for straddle or isolation packers. Packers have an effective range of hole diameters beyond which they will not set or will fail when inflated.

Calipers in cased holes are used to determine casing diameters where remedial work must be performed on the well. For various reasons, records of casing diameters and other information about existing water wells may be difficult to find. When video inspection of a well indicates that remedial work is necessary, and the work to be performed, such as casing repair, depends on a knowledge of the exact well diameters, then the caliper becomes a valuable device.

Figure IV-2 is the caliper log of a well that was thought to contain two different sizes of casing. The caliper clearly indicates that a third diameter

was either placed when the well was drilled, or put in at a later date during a repair job. The caliper log confirms a visual inspection made previously of badly damaged casing just below 200 feet and a breached hole at 215 feet in 14 inch casing that is the result of a compression failure.

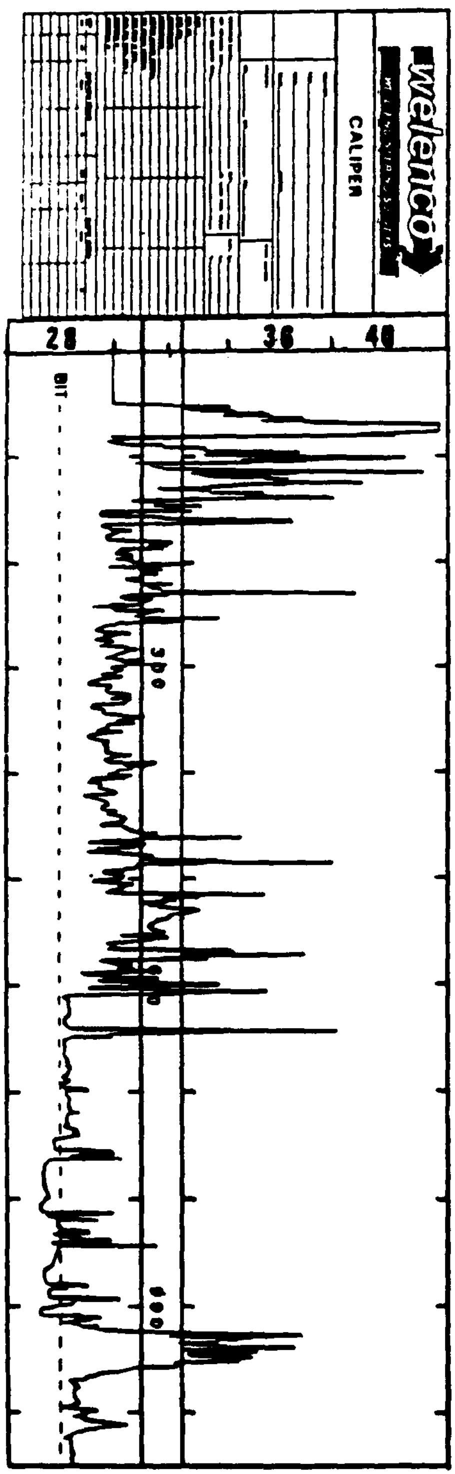


Figure IV-1
Caliper Log of Open Hole

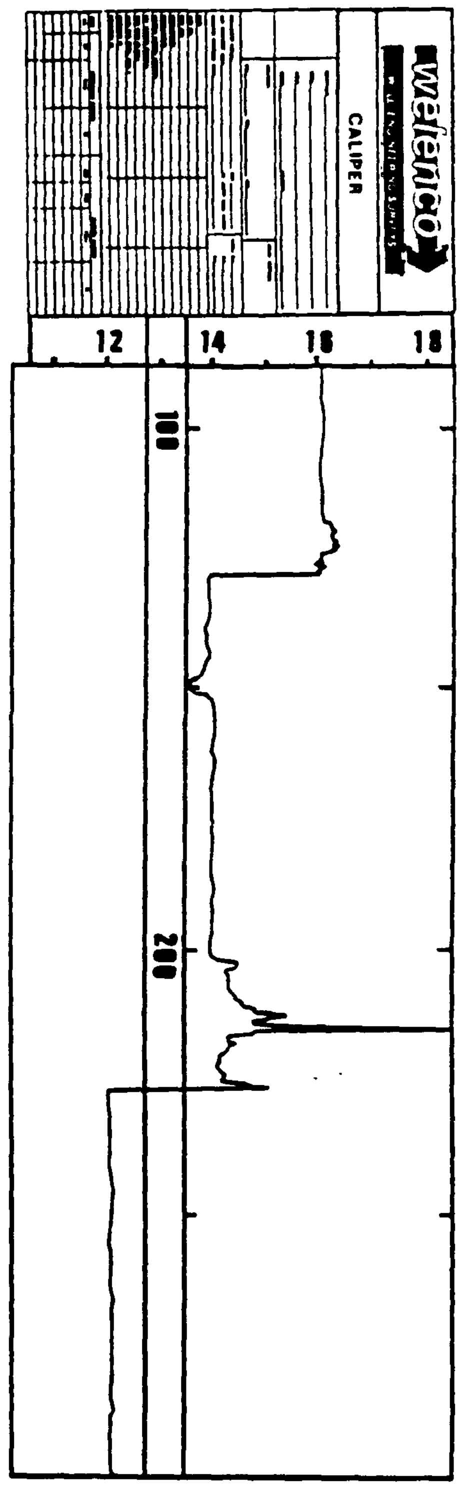


Figure IV-2
Caliper Log of Cased Hole

welenco

Caliper Gamma-Ray

COMPANY: JAMES M. MONTGOMERY, CONS. ENG. INC.

WELL: DSB - 3

FIELD: SIERRA ARMY DEPOT

STATE: CALIFORNIA COUNTY: LASSEN

LOCATION:

SEC. ______ TWP. ______ RGE. ______

OTHER SERVICES: ELECTRIC LOG

PERMANENT DATUM: G.L. ELEV. ______

LOG MEASURED FROM: G.L. ______ FT. ABOVE PERM. DATUM

DRILLING MEASURED FROM: G.L.

ELEV.: K.B. ______ D.F. ______ G.L. ______

DATE	2-19-90	2-19-90	
RUN NO.	ONE	ONE	
TYPE LOG	GAMMA RAY	3 ARM CALIPER	
DEPTH-DRILLER	251'	251'	
DEPTH-LOGGER	250'	250'	
BOTTOM LOGGED INTERVAL	248'	245'	
TOP LOGGED INTERVAL	0'	0'	
TYPE FLUID IN HOLE	BENTONITE	BENTONITE	
MAX. REC. TEMP., DEG. F.	N/A	N/A	
RECORDED BY	ROBERTI	ROBERTI	
WITNESSED BY	MARINAI	MARINAI	

RUN	BORE-HOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	5"	5'	251'	6"	COND.	SURFACE	5'

2

EQUIPMENT DATA

Gamma Ray			
Run No.	ONE		
Tool Model No.	G27X4LD		
Diameter	2"		
Detector Model No.	--		
Type	SCINT.		
Length	4"		
Distance to N. Source	NONE		

General			
Hoist Truck No.	SB81		
Instrument Truck No.	SB81		
Tool Serial No.	153		

Run No.			
Log Type			
Tool Model No.			
Diameter			
Detector Model No.			
Type			
Length			
Source Model No.			
Serial No.			
Spacing			
Type			
Strength			

LOGGING DATA

General				Gamma Ray							
Run No.	Depths From	Depths To	Speed Ft/Min.	T.C. Sec.	Sens. Settings	Zero Div. L or R	API G.R. Units per Log Div.	T.C. Sec.	Sens. Settings	Zero Div. L or R	API N. Units per Log Div.
1	248'	0'	20	5	100/1000	5L	5				
1	50'	0'	20	5	500/1000	0L	25 (X5 SCALE)				

Reference Literature:

Remarks:

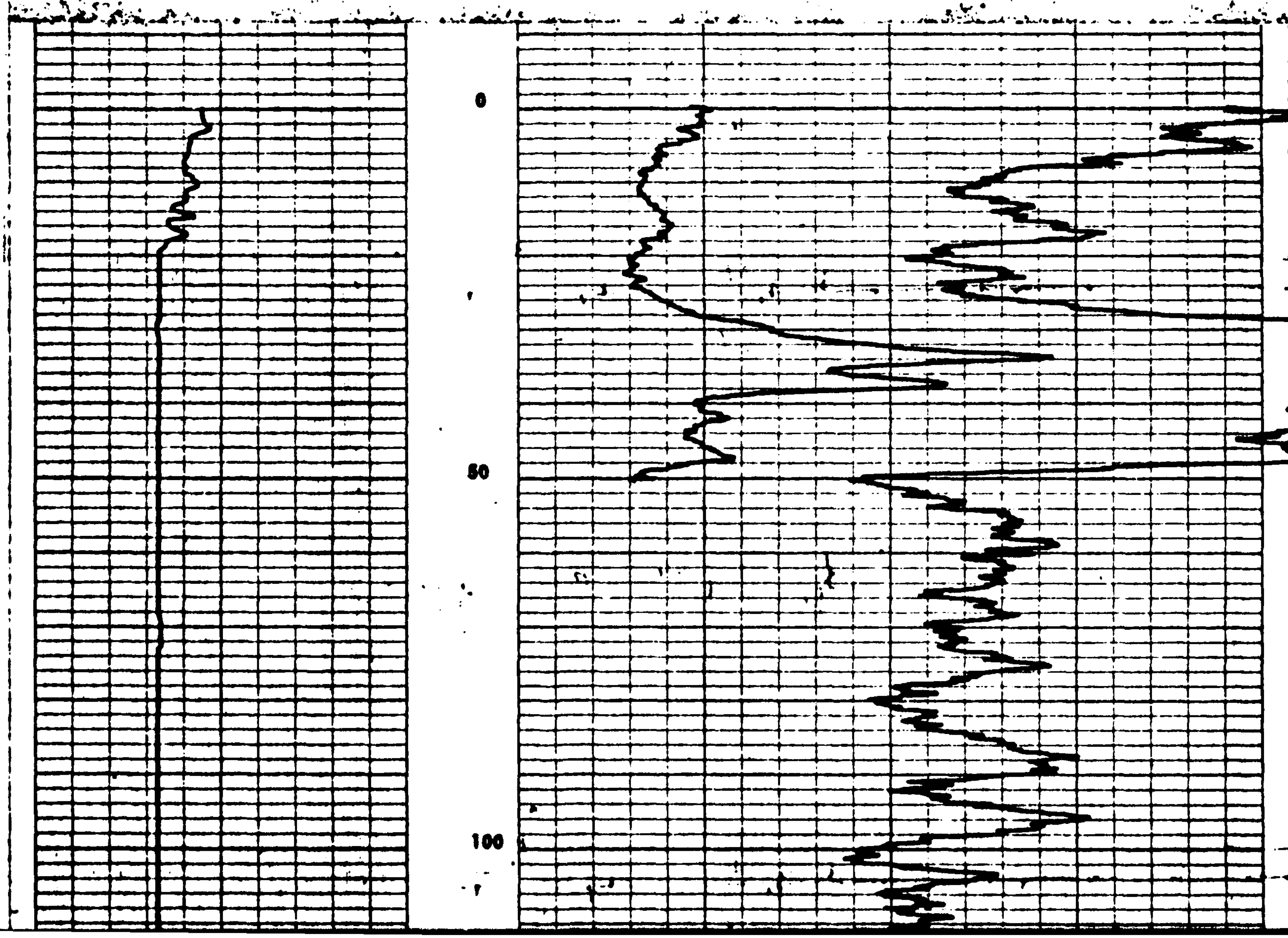
Fold Here

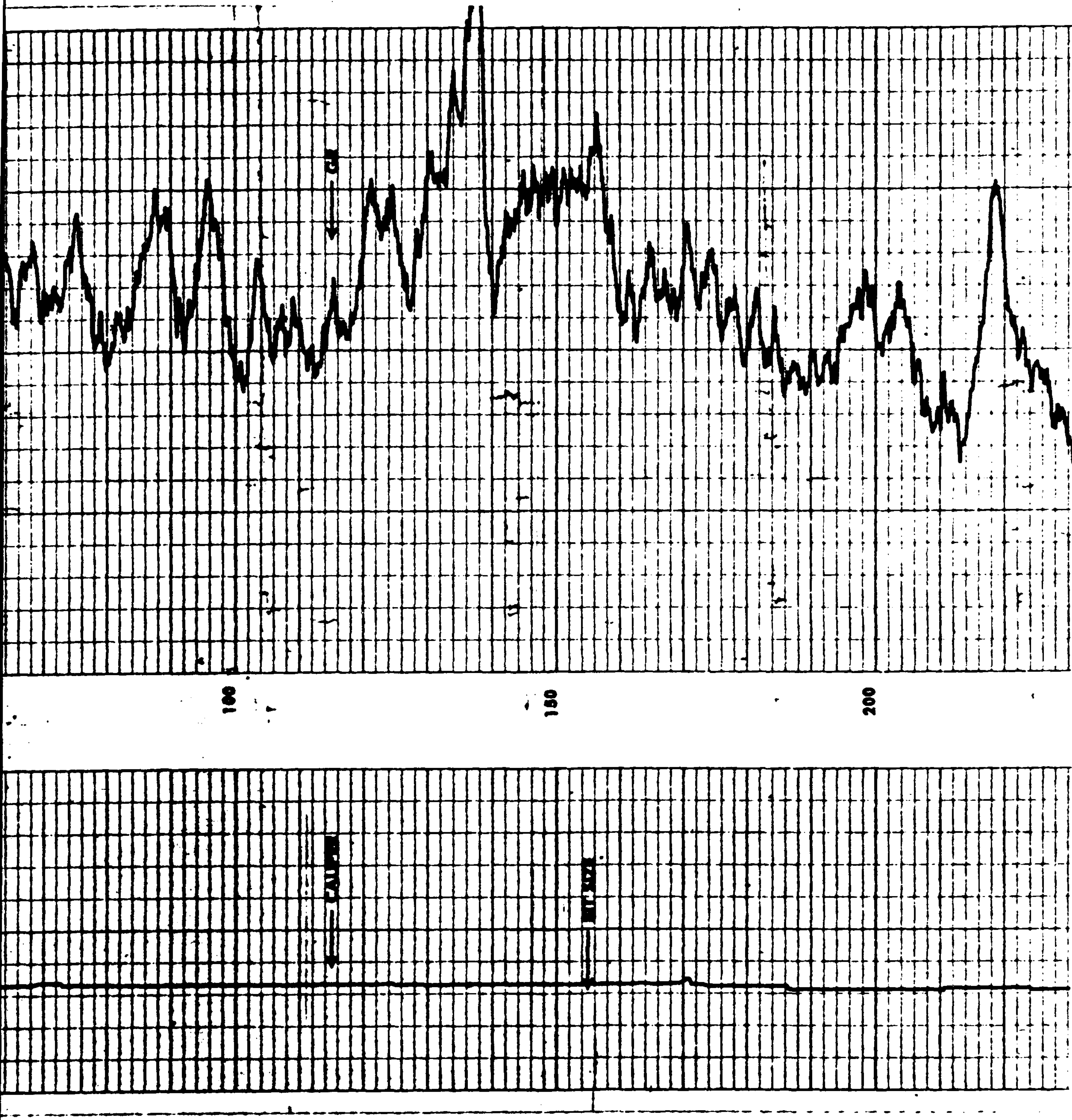
CALIPER HOLE DIAMETER IN INCHES	DEPTHS	GAMMA RAY API UNITS

3

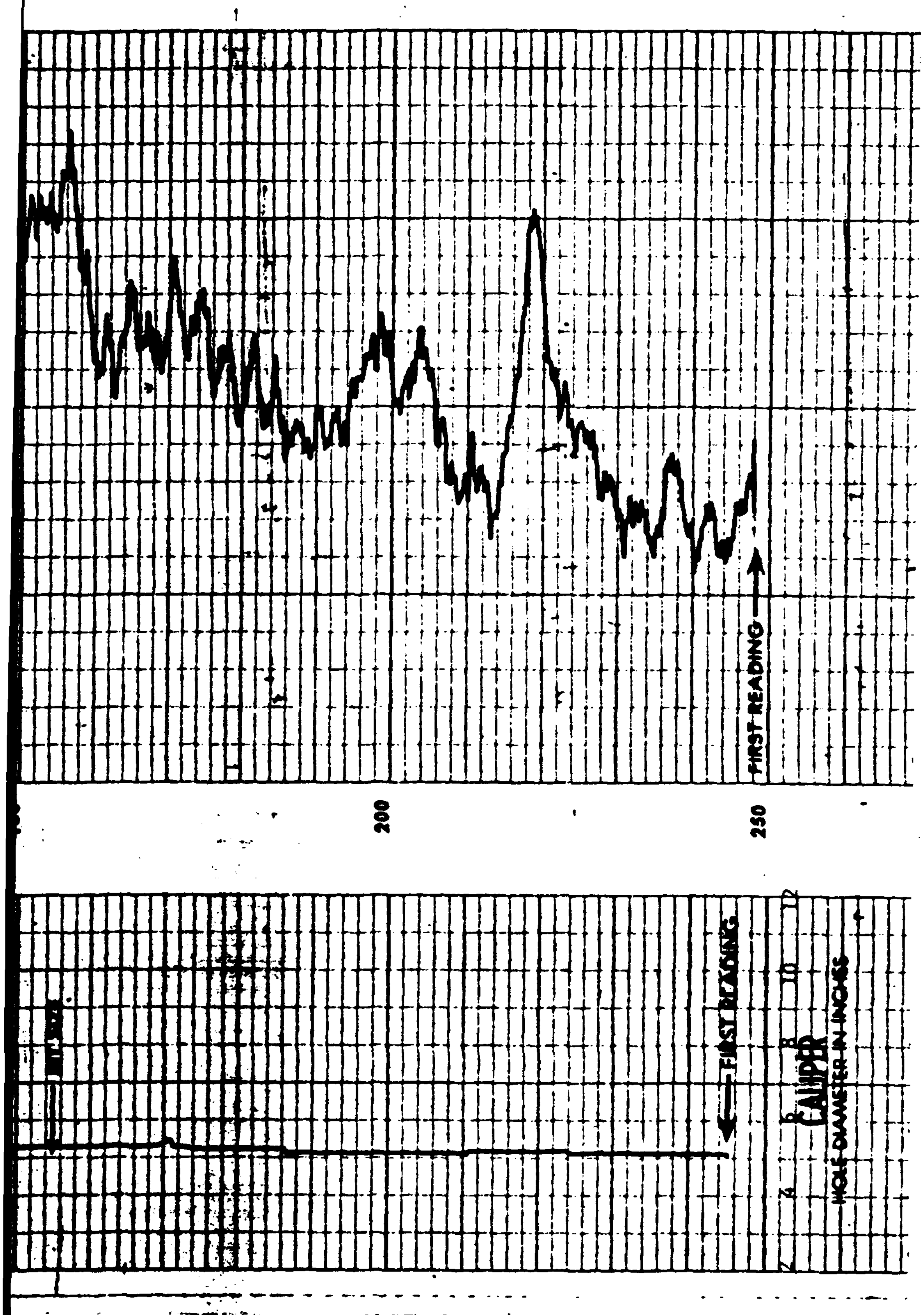
Fold Here

CALIPER HOLE DIAMETER IN INCHES	DEPTHS	GAMMA RAY API UNITS
2 12		25 125 0 X5 SCALE 500





4


FIRST READING
200
250
FIRST READING
CALIPER
HOLE DIAMETER IN INCHES
4
6
8
10
12

welenco

Caliper Survey

COMPANY JAMES M. MONTGOMERY, CONS. ENG. INC.

WELL DSB - 4

FIELD SIERRA ARMY DEPOT

STATE CALIFORNIA COUNTY LASSEN

LOCATION:

SEC. TWP. RGE.

OTHER SERVICES: ELECTRIC LOG

PERMANENT DATUM: G.L. ELEV.

LOG MEASURED FROM G.L. FT. ABOVE PERM. DATUM

DRILLING MEASURED FROM G.L.

ELEV.: K.B.

D.F.

G.L.

DATE	3-16-90		
RUN NO.	ONE		
TYPE LOG	3 ARM CALIPER		
DEPTH-DRILLER	250'		
DEPTH-LOGGER	248'		
BOTTOM LOGGED INTERVAL	247'		
TOP LOGGED INTERVAL	0'		
TYPE FLUID IN HOLE	BENTONITE		
MAX. REC. TEMP., DEG. F.	N/A		
RECORDED BY	ROBERTI		
WITNESSED BY	SHELLY HILL		

RUN	BORE-HOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	5"	SURFACE	250'	NONE			

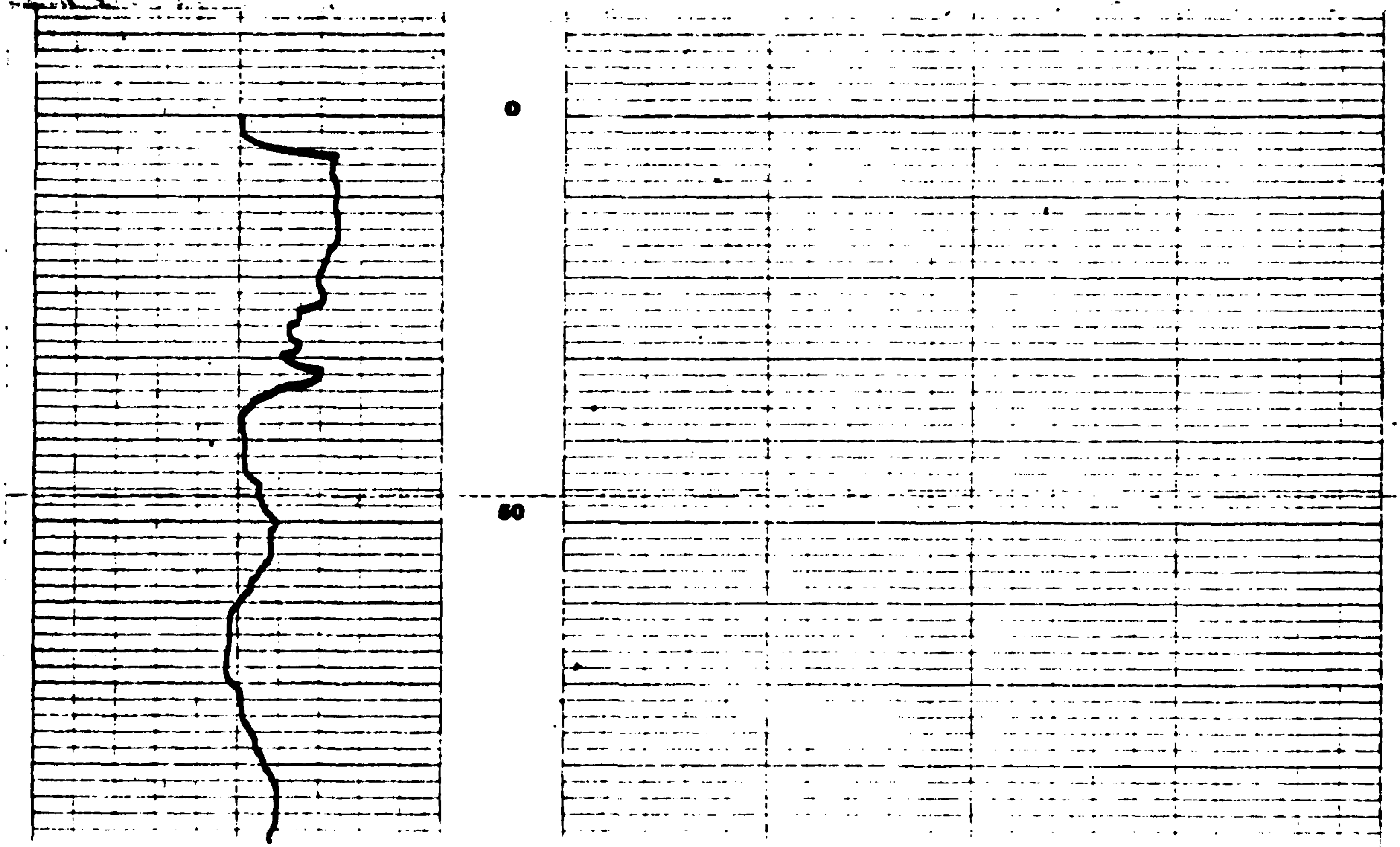
Remarks:

2

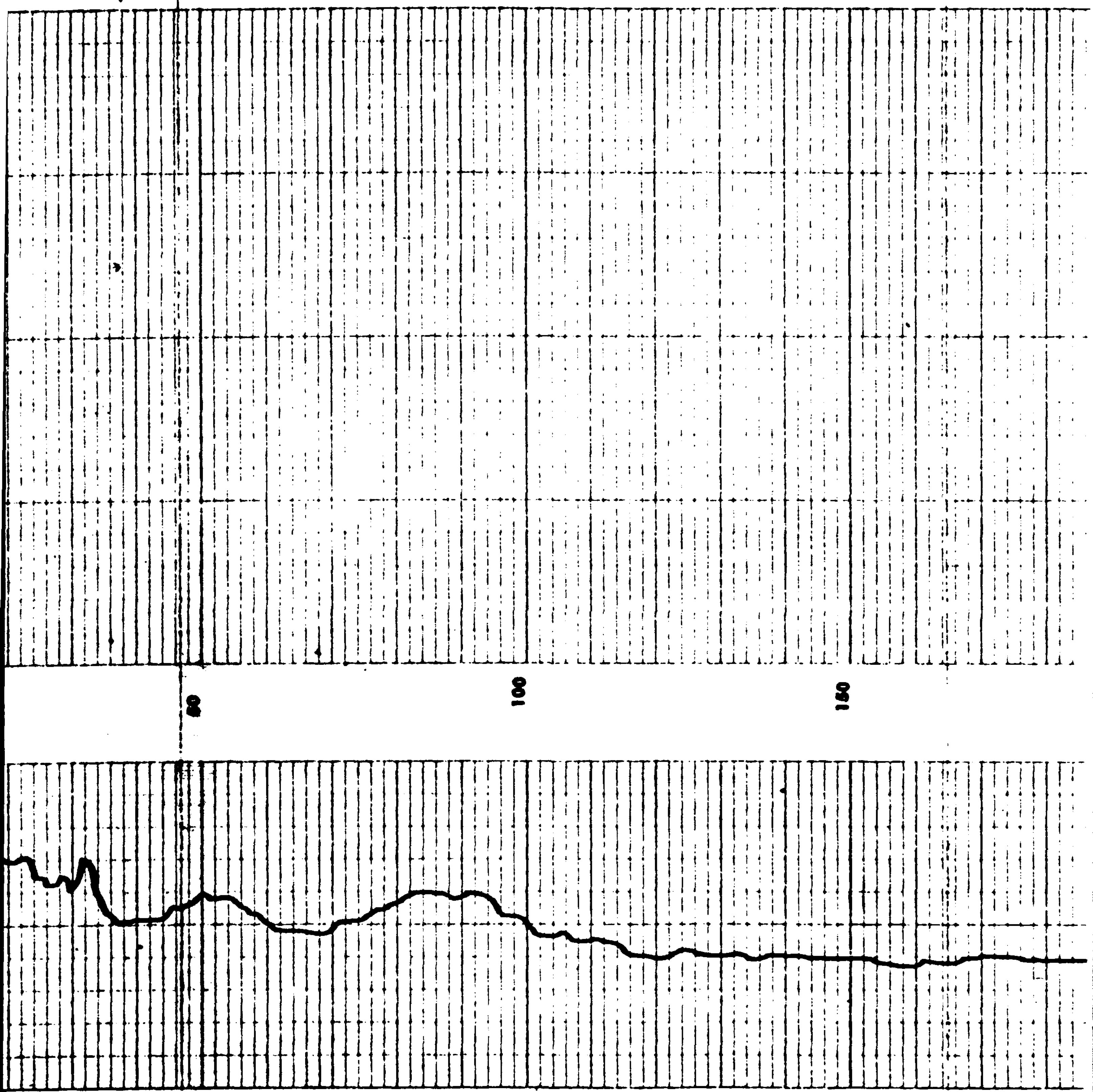
Remarks:

Fold Here

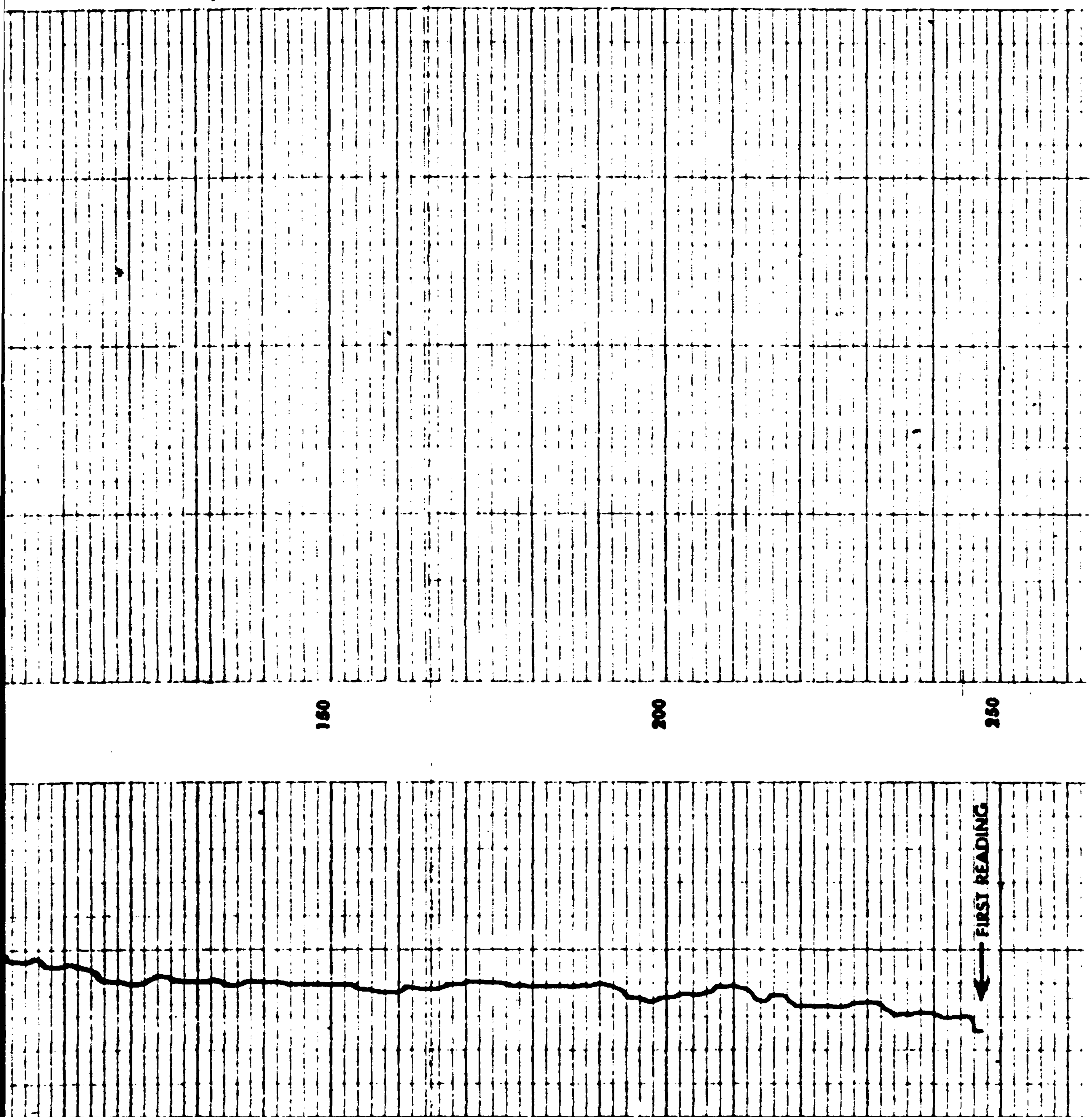
CALIPER HOLE DIAMETER IN INCHES	DEPTHS	
2 12		



3



4



welenco

ELECTRIC LOG

FILING NO

COMPANY JAMES M. MONTGOMERY, CONS. ENG. INC.

WELL DSB - 4

FIELD SIERRA ARMY DEPOT

STATE CALIFORNIA COUNTY LASSEN

LOCATION:

SEC. TWP RGE.

OTHER SERVICES

CALIPER SURVEY

Permanent Datum: G.L. , Elev.

Log Measured From G.L. , Ft. Above Perm. Datum

Drilling Measured From G.L.

Elev.: K.B.

D.F.

G.L.

Date	3-16-90			
Run No.	ONE			
Depth—Driller	250'			
Depth—Logger	248'			
Btm. Log Inter.	247'			
Top Log Inter.	50'			
Casing—Driller	NONE @	@	@	@
Casing—Logger	--			
Bit Size	5"			
Type Fluid in Hole	BENTONITE			
Dens. | Visc.	N/A	|	|	|
pH | Fluid Loss	N/A | ml	ml	ml	ml
Source of Sample	CIRC.			
Rm @ Meas. Temp.	5.19 @ 75 °F	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	5.19 @ 75 °F	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	N/A @ °F	@ °F	@ °F	@ °F
Source: Rmf Rmc	M |	|	|	|
Rm @ BHT	N/A @ °F	@ °F	@ °F	@ °F
Time Since Circ.	2 HOURS			
Max. Rec. Temp.	N/A °F	°F	°F	°F
Equip. | Location	SB81 | RENO	|	|	|
Recorded By	ROBERTI			
Witnessed By	SHELLY HILL			

This Heading and Log Conform To API RP 31

Fold Here

REMARKS

Scale Changes

Type Log	Depth	Scale Up Hole	Scale Down Hole

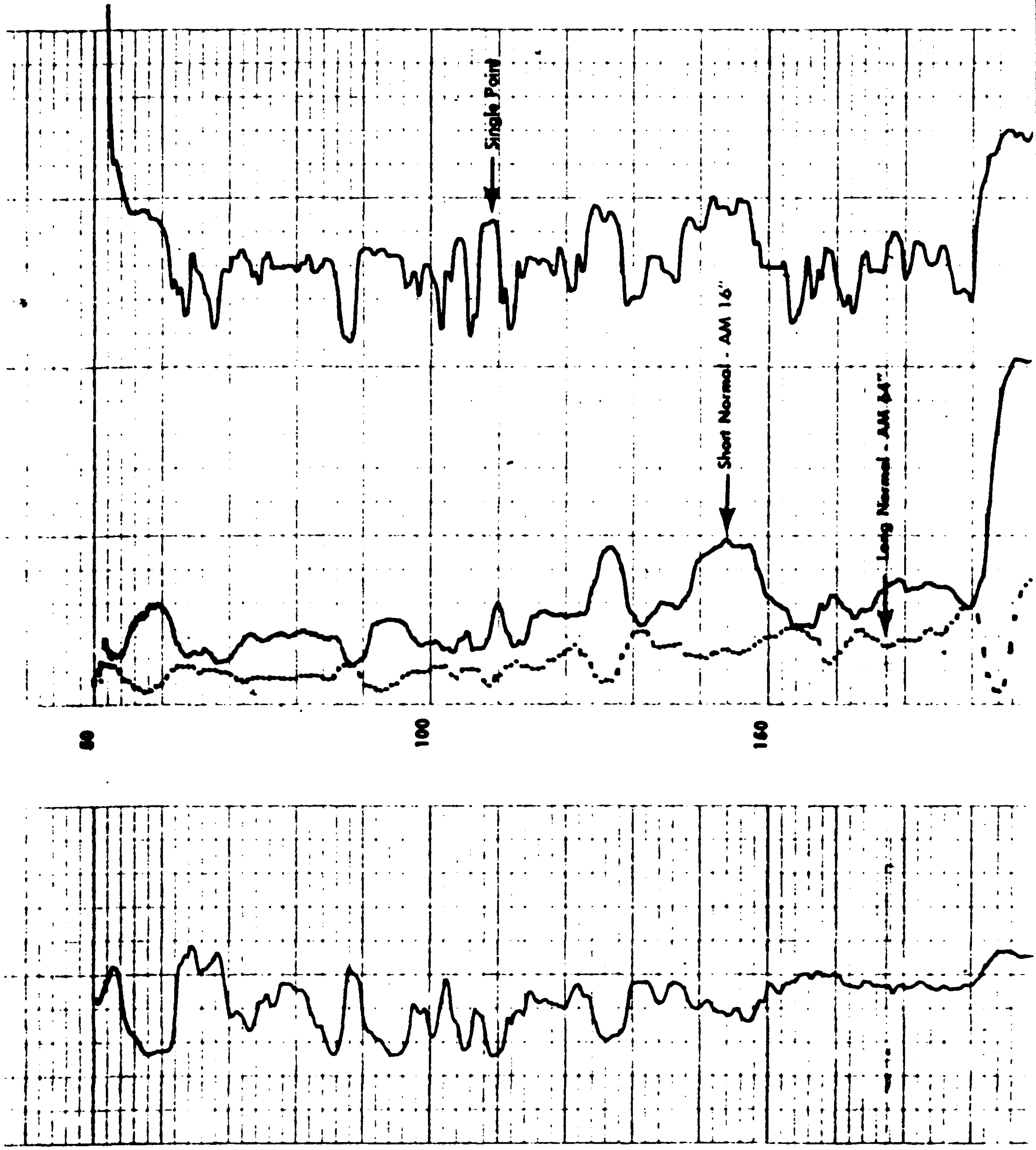
Changes in Mud Type or Additional Samples

Date	Sample No.	Depth—Driller	Type Fluid in Hole	Dens.	Visc.

Dens. | Visc.	|	|
ph | Fluid Loss	| ml	|
Source of Sample		
R_m @ Meas. Temp.	@ °F	@ °F
R_{mf} @ Meas. Temp.	@ °F	@ °F
R_{mc} @ Meas. Temp.	@ °F	@ °F
Source: R_{mf} | R_{mc}	|	|
R_m @ BHT	@ °F	@ °F
R_{mf} @ BHT	@ °F	@ °F
R_{mc} @ BHT	@ °F	@ °F

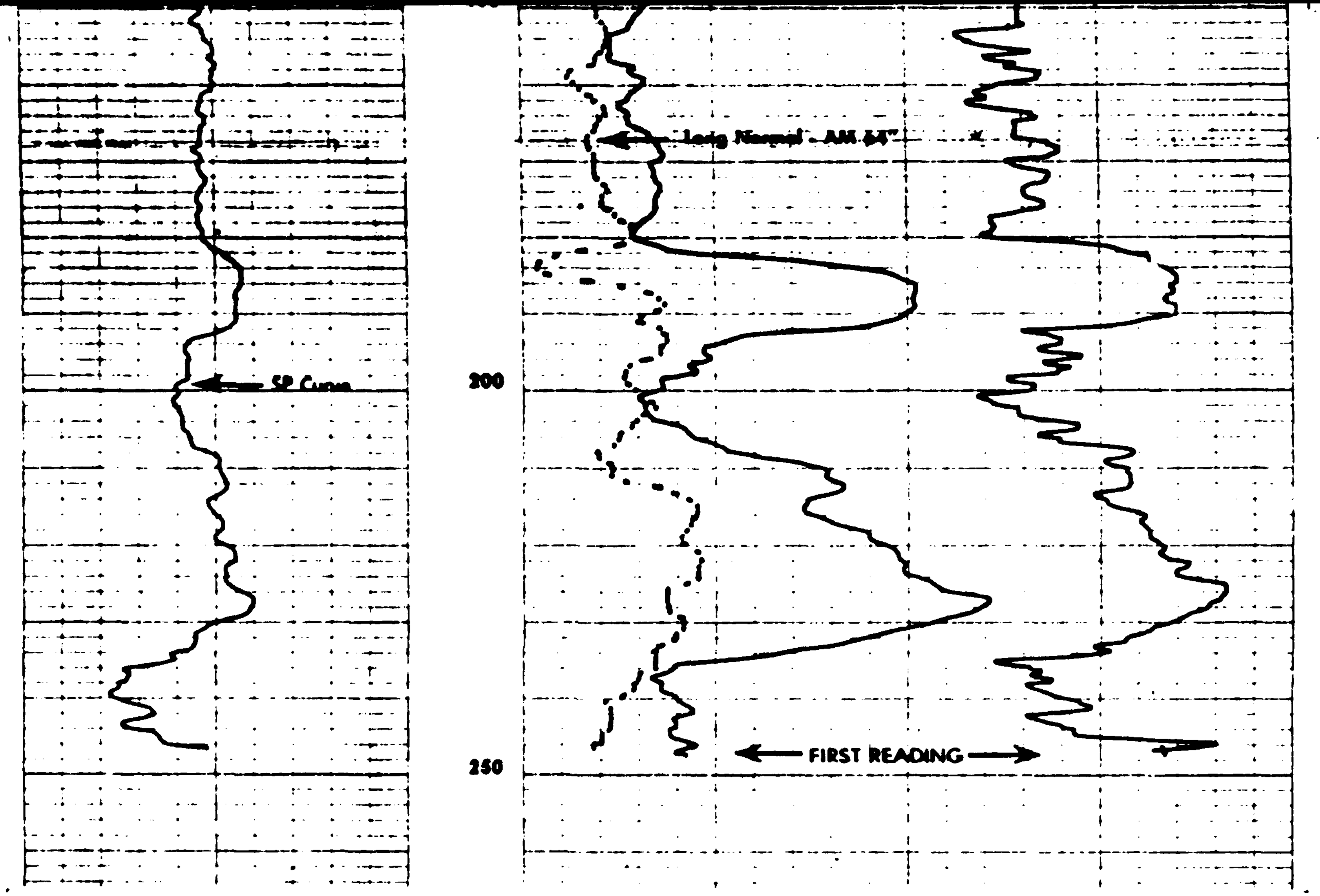
Equipment Data				
Run No.	Tool Type	Pad Type	Tool Position	Other
ONE	ELECTRIC LOG		FREE	

SPONTANEOUS POTENTIAL millivolts	Depths	RESISTIVITY ohms. m²/m	RESISTIVITY ohms. m²/m



3

4



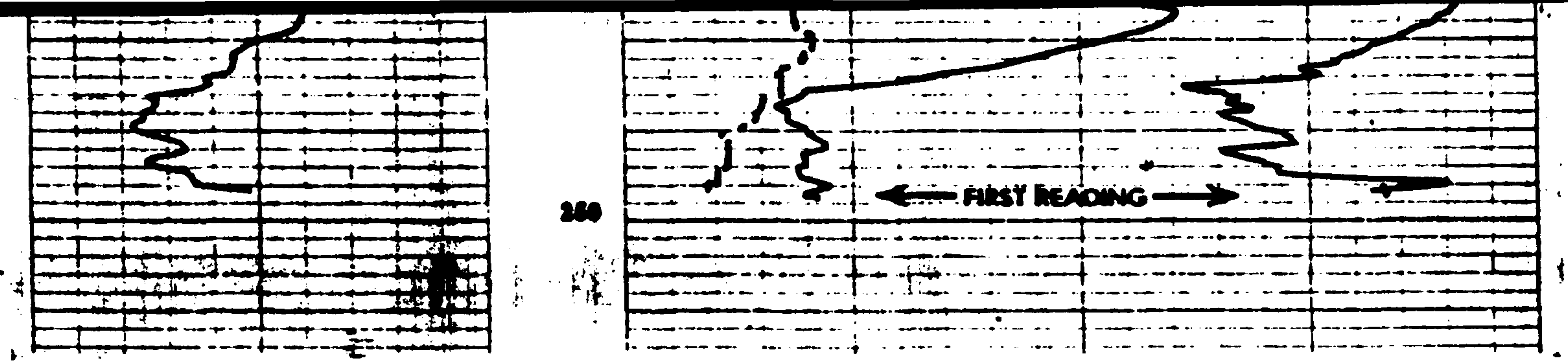
ELECTRIC LOG ANALYSIS

COMPANY: J.M. MONTGOMERY	WELL: DSB - 4	BIT SIZE: 5"
FIELD: SIERRA ARMY DEPOT	COUNTY: LASSEN	LOG T.D. 247'
STATE: CALIFORNIA	SEC: ____ TWP: ____ RGE: ____	

Rm = 5.19 at 75 °F

Rmf = 5.19 at 75 °F

5



ELECTRIC LOG ANALYSIS

COMPANY: J.M. MONTGOMERY WELL: DSB - 4 BIT SIZE: 5"

FIELD: SIERRA ARMY DEPOT COUNTY: LASSEN LOG T.D. 247'

STATE: CALIFORNIA SEC: ____ TWP: ____ RGE: ____

Rm = 5.19 at 75 °F

Rmf = 5.19 at 75 °F

LOG DEPTH	S.P.	Rwe	Rw RANGE (ohm m^2/m)		E.C. RANGE (Umhos)		TDS RANGE (ppm)		REMARKS
			NaCl	$NaHCO_3$	NaCl	$NaHCO_3$	NaCl	$NaHCO_3$	
50' - 130'	-12	3.51	3.51	4.13	2849	2421	1510	2420	CLASS II OR III
130'- 180'	0	5.19	5.19	6.11	1927	1637	1021	1640	CLASS II
180'- 247'	+10	7.19	7.19	8.46	1391	1182	737	1180	CLASS II

6

50' - 130'	-12	3.51	3.51	4.13	2849	2421	1510	2420	CLASS II OR III
130'- 180'	0	5.19	5.19	6.11	1927	1637	1021	1640	CLASS II
180'- 247'	+10	7.19	7.19	8.46	1391	1182	737	1180	CLASS II

CHEMICAL PROPERTIES	CLASS I (Excellent to Good)	CLASS II (Good to Injurious)	CLASS III (Injurious to Unsatisfactory)
TOTAL DISSOLVED·SOLIDS ppm (mg/l)	LESS THAN 700	700 - 2,000	MORE THAN 2,000

THIS INTERPRETATION REPRESENTS OUR BEST JUDGEMENT. NEVERTHELESS, SINCE ALL INTERPRETATIONS ARE OPINIONS BASED SOLELY ON INFERENCES FROM ELECTRICAL AND OTHER MEASUREMENTS, WE CANNOT AND DO NOT GUARANTEE THE ACCURACY OR CORRECTNESS OF THIS INTERPRETATION AND SHALL NOT BE LIABLE FOR ANY COSTS, DAMAGES OR EXPENSES THAT MAY BE INCURRED FROM THIS OR ANY OTHER INTERPRETATION.

DATE: 3-19-90

ROBERTI
WELENCO LOG ANALYST

welenco

Caliper Survey

COMPANY: JAMES M. MONTGOMERY, CONS. ENG. INC.

WELL: DSB - 6

FIELD: SIERRA ARMY DEPOT

STATE: CALIFORNIA COUNTY: LASSEN

LOCATION:

SEC: TWP: RGE:

OTHER SERVICES: ELECTRIC LOG

PERMANENT DATUM: G.L. ELEV.:

LOG MEASURED FROM: G.L. FT. ABOVE PERM. DATUM

DRILLING MEASURED FROM: G.L.

ELEV.: K.B. D.F. G.L.

DATE	3-6-90		
RUN NO.	ONE		
TYPE LOG	3 ARM CALIPER		
DEPTH-DRILLER	250'		
DEPTH-LOGGER	250'		
BOTTOM LOGGED INTERVAL	249'		
TOP LOGGED INTERVAL	0'		
TYPE FLUID IN HOLE	BENTONITE		
MAX. REC. TEMP., DEG. F.	N/A		
RECORDED BY	ROBERTI		
WITNESSED BY	MARINAI		

RUN	BORE-HOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	15"	SURFACE	250'	NONE			

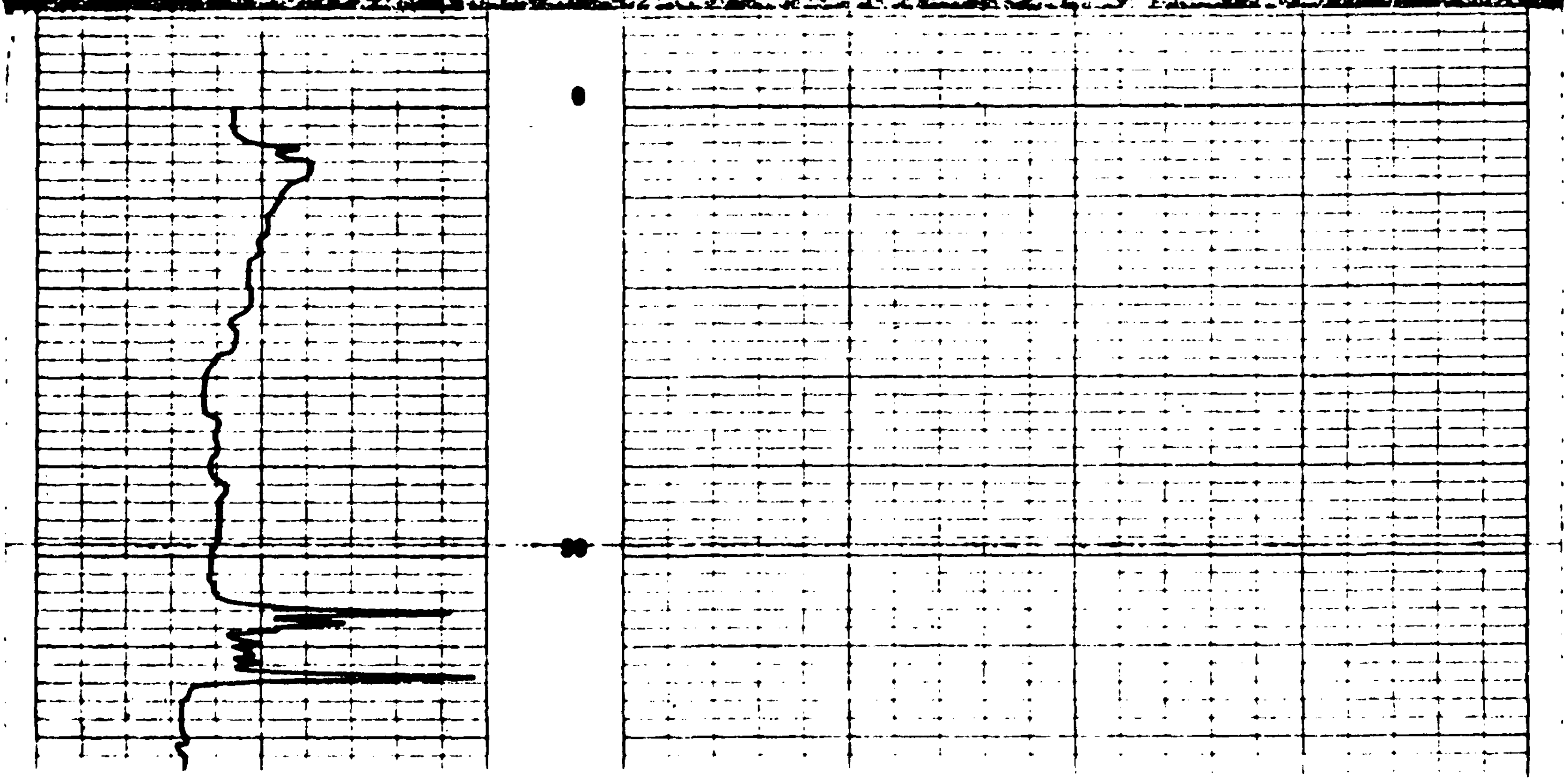
Remarks:

C LOG

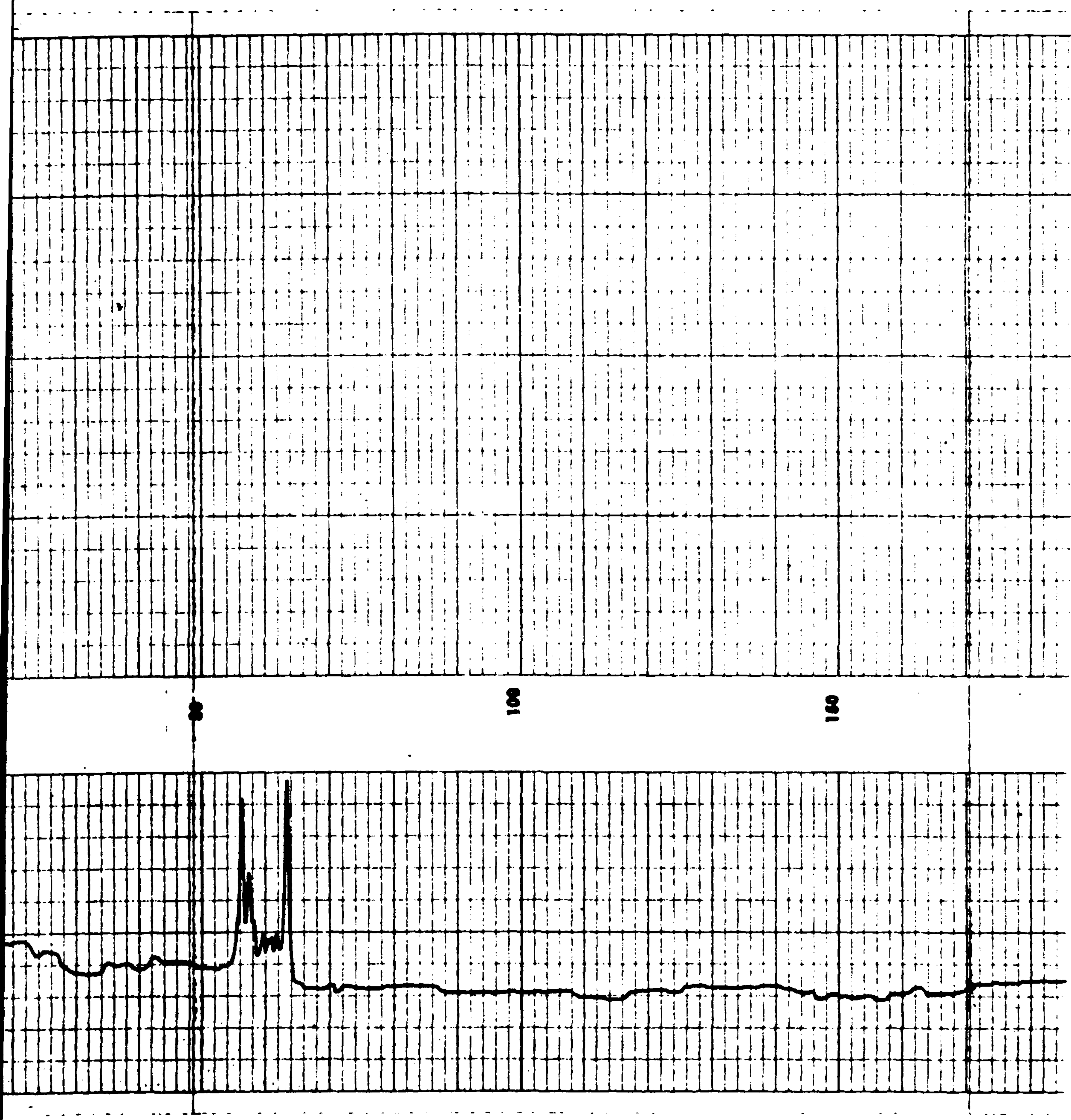
Remarks:

Fold Here

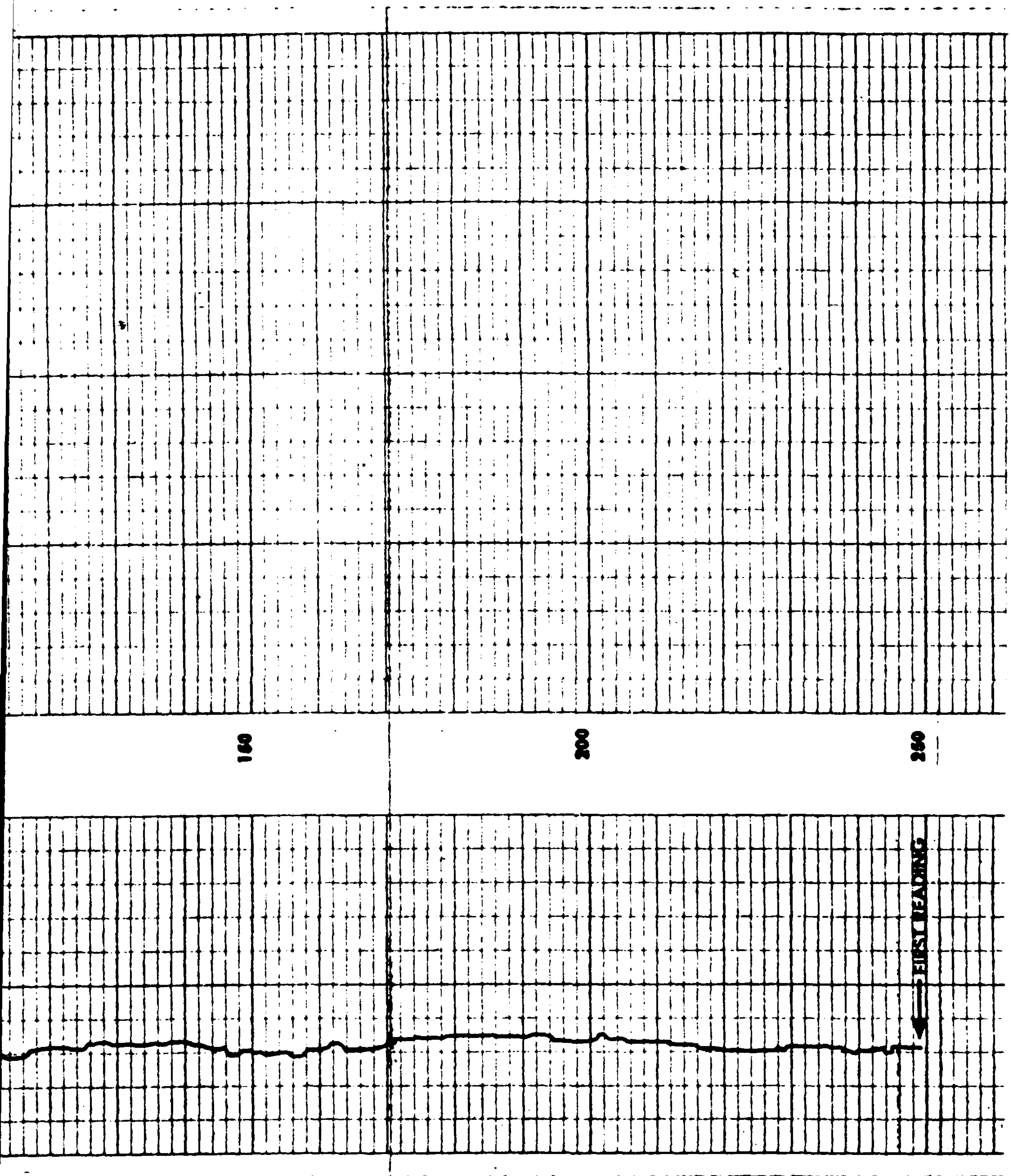
CALIPER HOLE DIAMETER IN INCHES	DEPTHS	
2 12		



2



3



4

welenco

ELECTRIC LOG

FILING NO

COMPANY JAMES M. MONTGOMERY, CONS. ENG. INC.

WELL DSB - 1

FIELD SIERRA ARMY DEPOT

STATE CALIFORNIA COUNTY LASSEN

LOCATION

SEC. ____ TWP ____ RGE ____

OTHER SERVICES
CALIPER

Permanent Datum: G.L. , Elev. ____
Log Measured From G.L. , ____ Ft. Above Perm. Datum
Drilling Measured From G.L.

Elev.: K.B. ____
D.F. ____
G.L. ____

Date	3-3-90			
Run No.	ONE			
Depth—Driller	250'			
Depth—Logger	250'			
Btm. Log Inter.	249'			
Top Log Inter.	40'			
Casing—Driller	NONE @	@	@	@
Casing—Logger	--			
Bit Size	5"			
Type Fluid in Hole	BENTONITE			
Dens. | Visc.	N/A |	|	|	|
pH | Fluid Loss	N/A | ml	| ml	| ml	| ml
Source of Sample	CIRC			
R_m @ Meas. Temp.	4.52 @ 75 °F	@ °F	@ °F	@ °F
R_{mf} @ Meas. Temp.	4.52 @ 75 °F	@ °F	@ °F	@ °F
R_{mc} @ Meas. Temp.	N/A @ °F	@ °F	@ °F	@ °F
Source: R_{mf} | R_{mc}	M |	|	|	|
R_m @ BHT	N/A @ °F	@ °F	@ °F	@ °F
Time Since Circ.	1 HOUR			
Max. Rec. Temp.	N/A °F	°F	°F	°F
Equip. | Location	SB81 | RENO	|	|	|
Recorded By	ROBERTI			
Witnessed By	MARINAI			

This Heading and Log Conform To API RP 31

Fold Here

REMARKS

Scale Changes

Type Log	Depth	Scale Up Hole	Scale Down Hole

Changes in Mud Type or Additional Samples

Date | Sample No.	Depth—Driller	Type Fluid in Hole	Dens. | Visc.	pH | Fluid Loss
3-3-90		MAKE UP WATER	N/A	N/A ml

Fold Here

This Heading and Log Conform To API RP 31

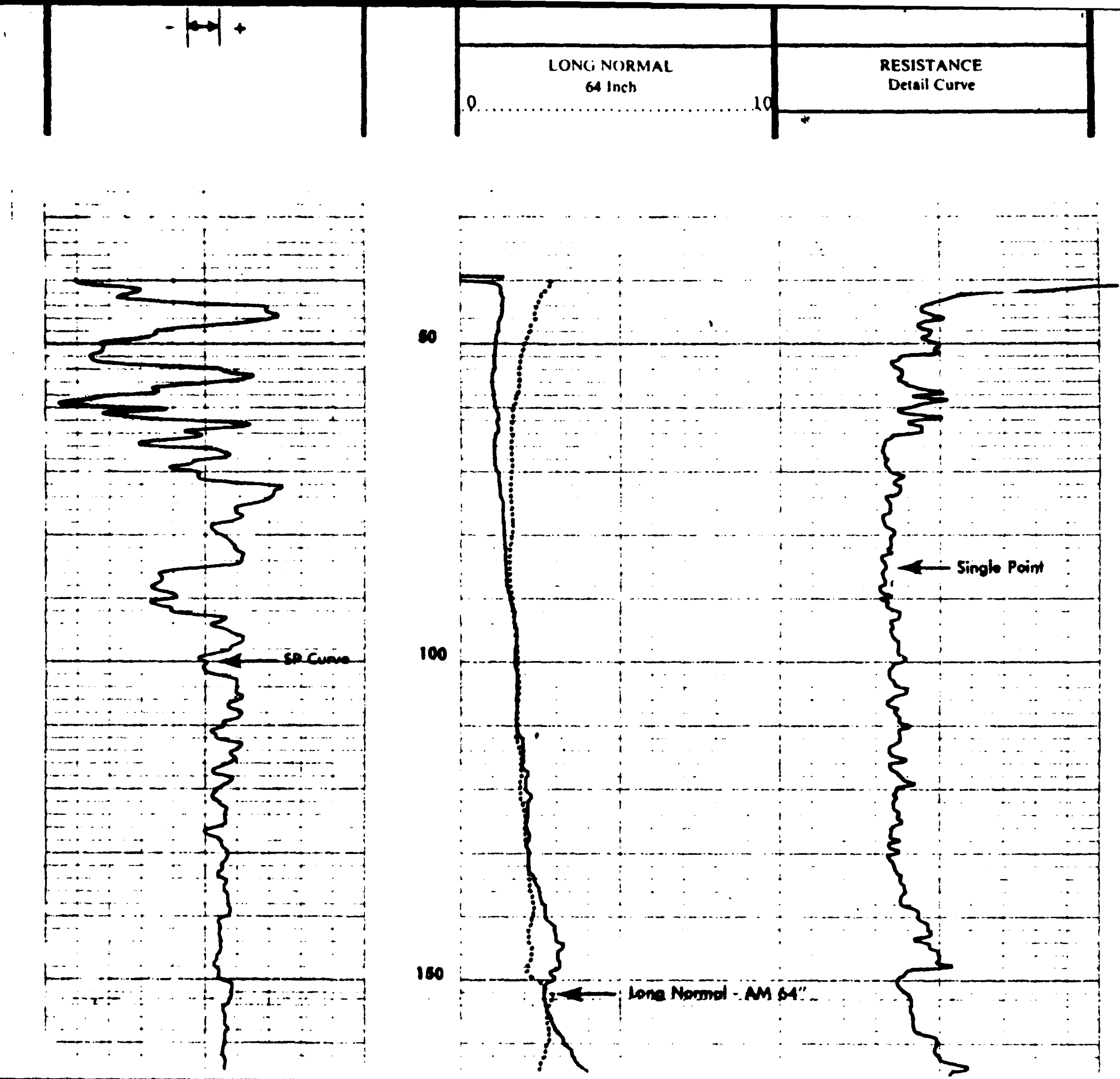
REMARKS

Changes in Mud Type or Additional Samples		
Date | Sample No.	3-3-90 |	|
Depth—Driller		
Type Fluid in Hole	MAKE UP WATER	
Dens. | Visc.	N/A |	|
ph | Fluid Loss	N/A | ml	|
Source of Sample	WATER TRUCK	
R_m @ Meas. Temp.	8.0 @ 75 °F	@ °F
R_{mf} @ Meas. Temp	8.0 @ 75 °F	@ °F
R_{mc} @ Meas. Temp.	@ °F	@ °F
Source: R_{mf} | R_{mc}	|	|
R_m @ BHT	@ °F	@ °F
R_{mf} @ BHT	@ °F	@ °F
R_{mc} @ BHT	@ °F	@ °F

Scale Changes			
Type Log	Depth	Scale Up Hole	Scale Down Hole

Equipment Data				
Run No.	Tool Type	Pad Type	Tool Position	Other
ONE	ELECTRIC LOG		FREE	

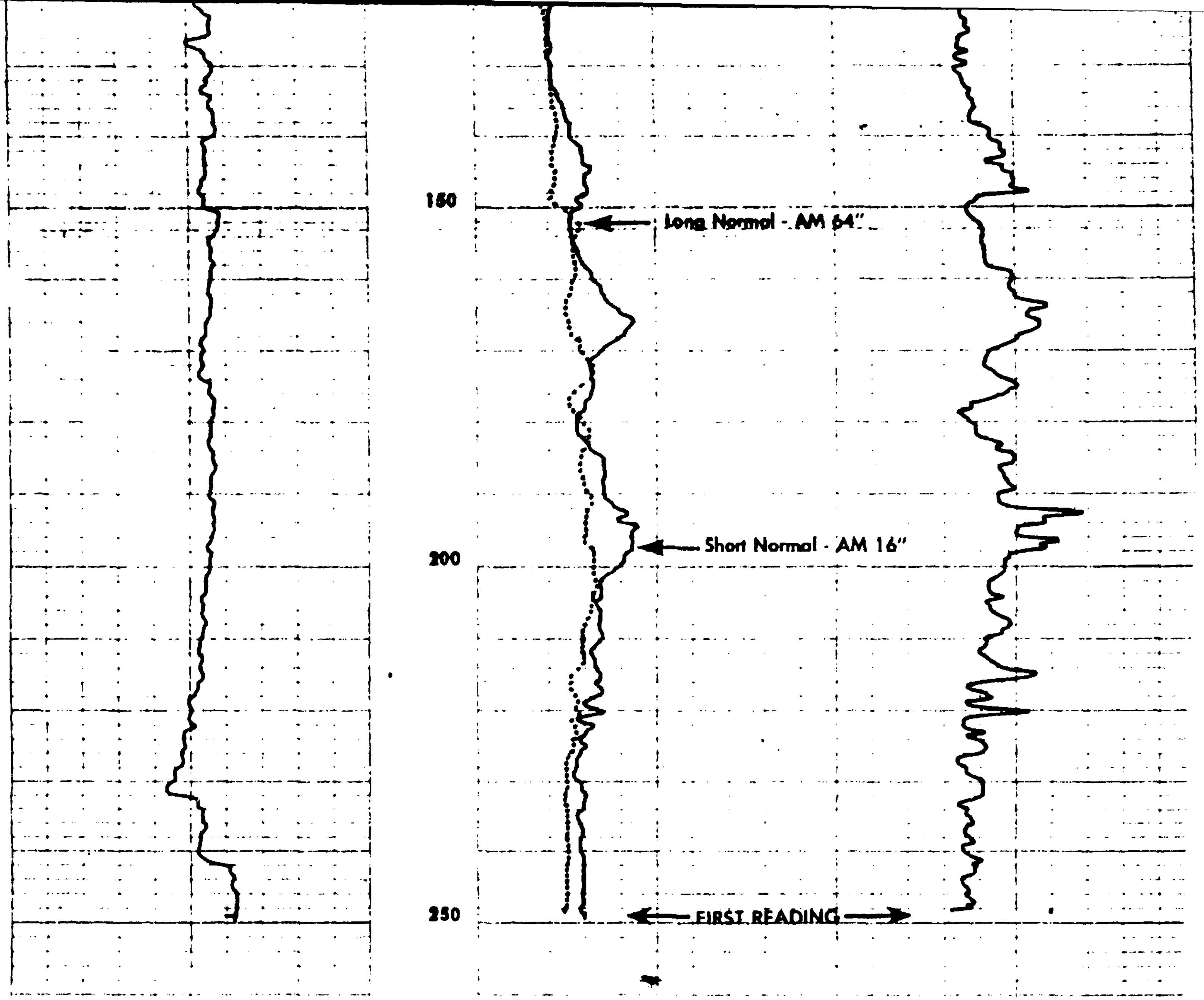
SPONTANEOUS POTENTIAL millivolts	Depths	RESISTIVITY ohms. m²/m	RESISTIVITY ohms. m²/m



LONG NORMAL
64 Inch
0
10
RESISTANCE
Detail Curve
50
100
150
SP Curve
Single Point
Long Normal - AM 64"

3

4



ELECTRIC LOG ANALYSIS

COMPANY: J.M. MONTGOMERY WELL: DSB-1 BIT SIZE: 5"

FIELD: SIERRA ARMY DEPOT COUNTY: LASSEN LOG T.D. 249'

5

ELECTRIC LOG ANALYSIS

COMPANY: J.M. MONTGOMERY WELL: DSB-1 BIT SIZE: 5"

FIELD: SIERRA ARMY DEPOT COUNTY: LASSEN LOG T.D. 249'

STATE: CALIFORNIA SEC: ____ TWP: ____ RGE: ____

Rm = 4.52 at 75 °F

Rmf = 4.52 at 75 °F

LOG DEPTH	S.P.	Rwe	Rw RANGE (ohm m^2/m) NaCl	Rw RANGE (ohm m^2/m) $NaHCO_3$	E.C. RANGE (Umhos) NaCl	E.C. RANGE (Umhos) $NaHCO_3$	TDS RANGE (ppm) NaCl	TDS RANGE (ppm) $NaHCO_3$	REMARKS
110'-249'	-4	3.97	3.97	4.67	2519	2141	1340	2140	CLASS II OR III

110'-249'	-4	3.97	3.97	4.67	2519	2141	1340	2140	CLASS II OR III

CHEMICAL PROPERTIES	CLASS I (Excellent to Good)	CLASS II (Good to Injurious)	CLASS III (Injurious to Unsatisfactory)
TOTAL DISSOLVED SOLIDS ppm (mg/l)	LESS THAN 700	700 - 2,000	MORE THAN 2,000

THIS INTERPRETATION REPRESENTS OUR BEST JUDGEMENT. NEVERTHELESS, SINCE ALL INTERPRETATIONS ARE OPINIONS BASED SOLELY ON INFERENCES FROM ELECTRICAL AND OTHER MEASUREMENTS, WE CANNOT AND DO NO GUARANTEE THE ACCURACY OR CORRECTNESS OF THIS INTERPRETATION AND SHALL NOT BE LIABLE FOR ANY CO DAMAGES OR EXPENSES THAT MAY BE INCURRED FROM THIS OR ANY OTHER INTERPRETATION.

DATE: 3-7-90

ROBERTI
WELENCO LOG ANALYST

6

welenco

Caliper Survey

COMPANY JAMES M. MONTGOMERY, CONS. ENG. INC.

WELL DSB - 6

FIELD SIERRA ARMY DEPOT

STATE CALIFORNIA COUNTY LASSEN

LOCATION:

SEC ____ TWP ____ RGE ____

OTHER SERVICES: ELECTRIC LOG

PERMANENT DATUM G.L. ELEV. ____

LOG MEASURED FROM G.L. FT. ABOVE PERM. DATUM

DRILLING MEASURED FROM G.L.

ELEV.: K.B. ____ D.F. ____ G.L. ____

DATE	3-6-90		
RUN NO.	ONE		
TYPE LOG	3 ARM CALIPER		
DEPTH-DRILLER	250'		
DEPTH-LOGGER	250'		
BOTTOM LOGGED INTERVAL	249'		
TOP LOGGED INTERVAL	0'		
TYPE FLUID IN HOLE	BENTONITE		
[illegible]	N/A		
RECORDED BY	ROBERTI		
WITNESSED BY	MARINAI		

RUN	BORE-HOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
[illegible]	5"	SURFACE	250'	NONE			

Fold Here

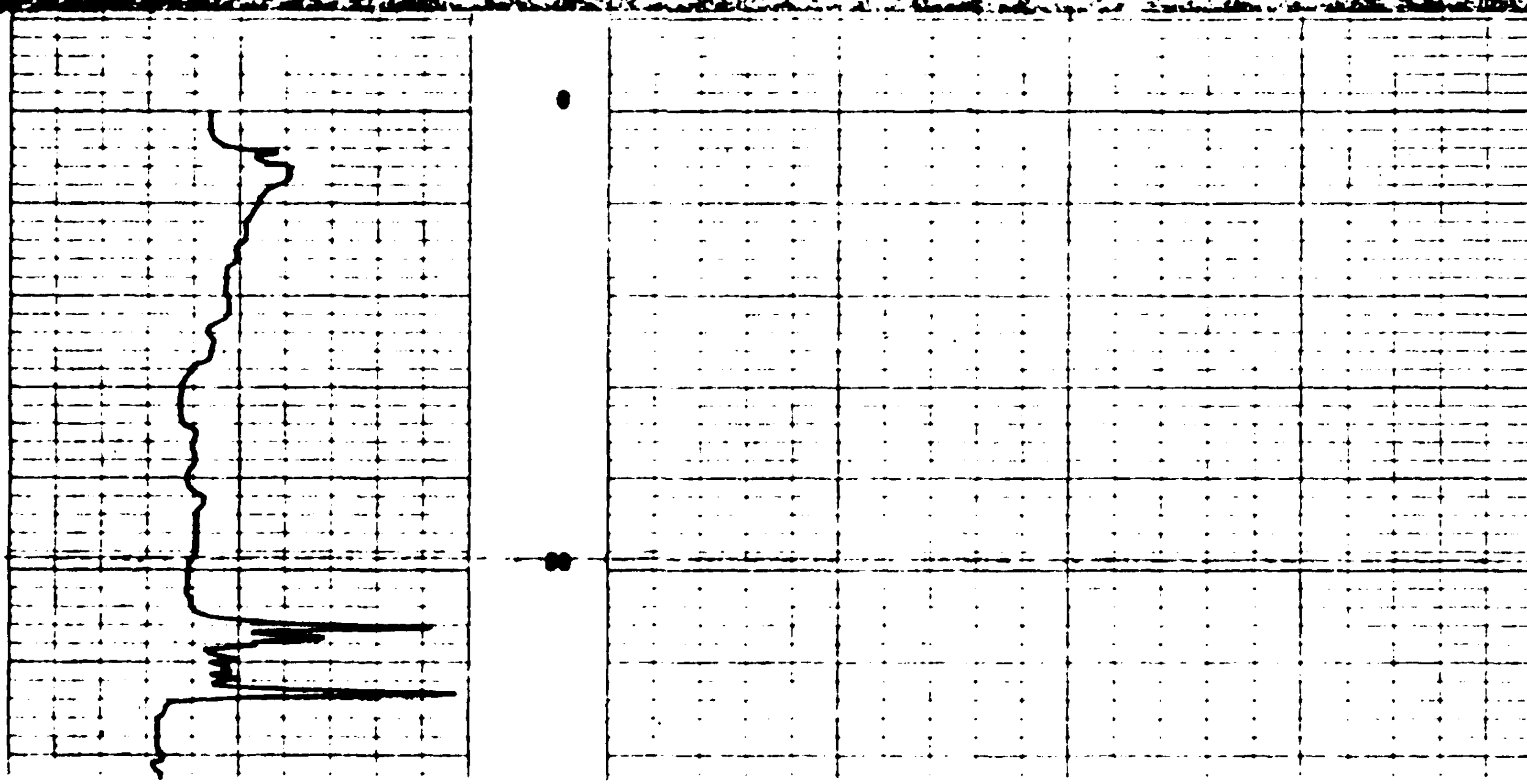
Remarks

C LOG

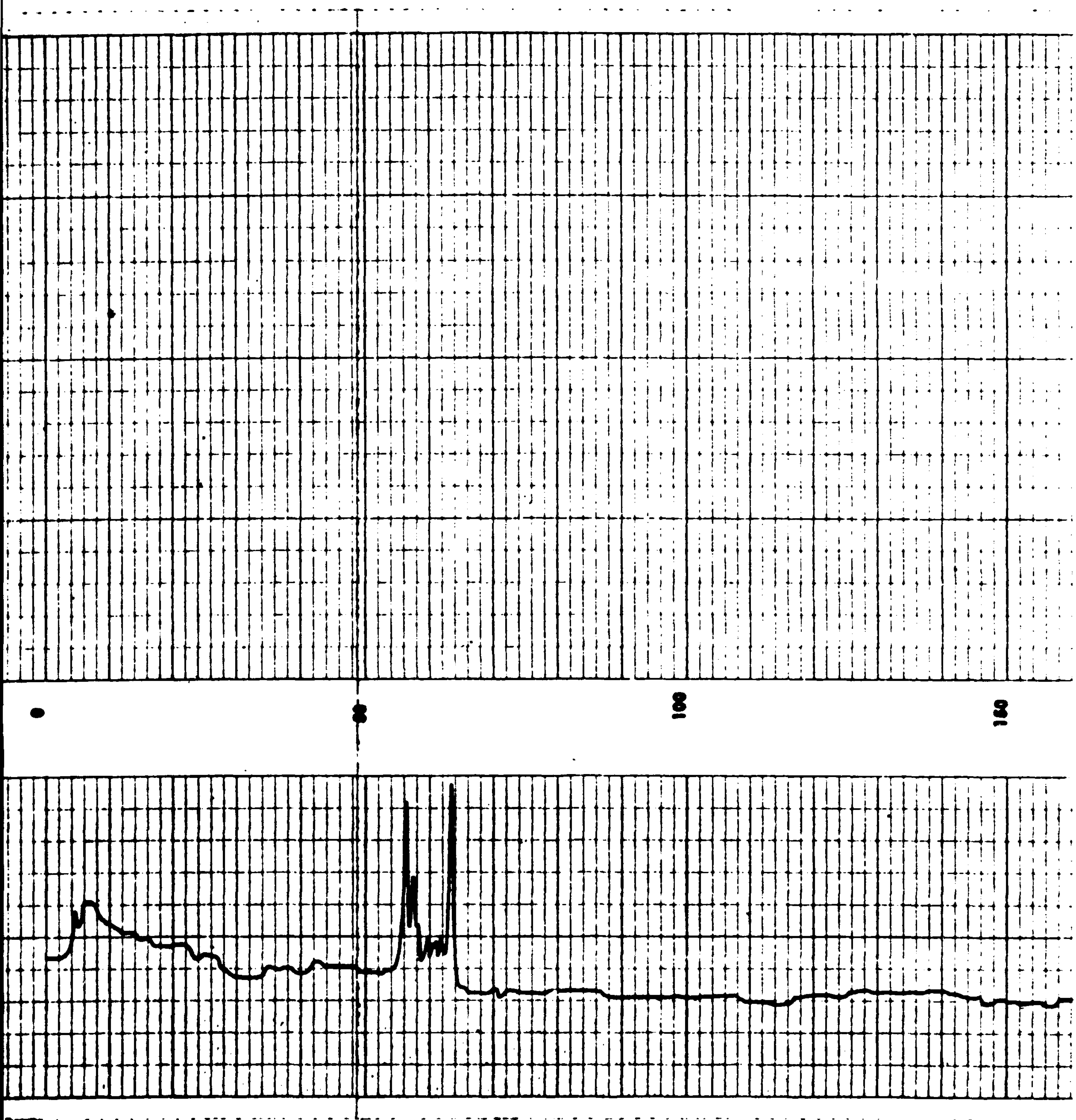
Remarks:

Fold Here

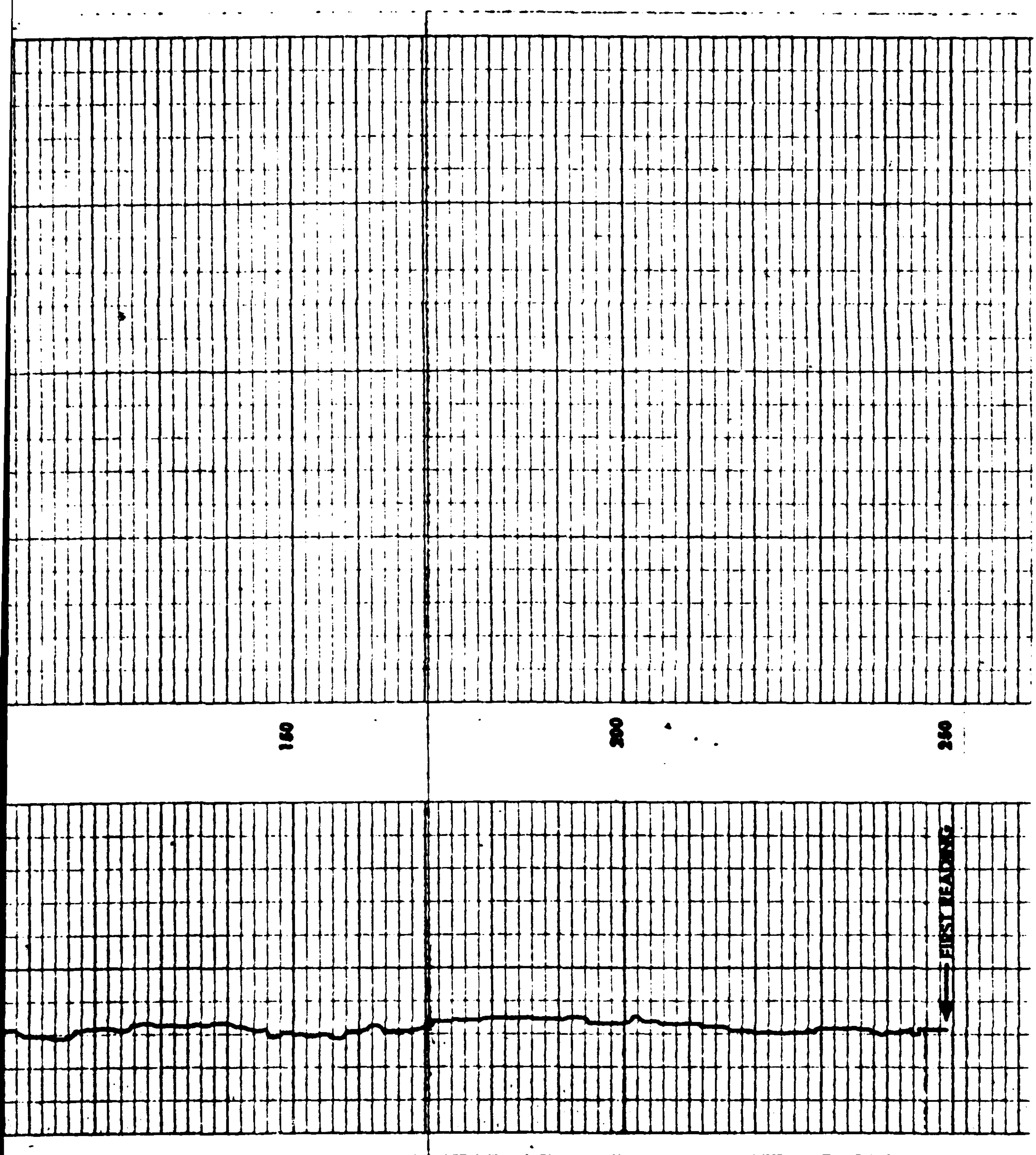
CALIPER HOLE DIAMETER IN INCHES	DEPTHS	
2 12		



2



3



4

welenco

Caliper Survey

COMPANY JAMES M. MONTGOMERY, CONS. ENG. INC.

WELL DSB - 2

FIELD SIERRA ARMY DEPOT

STATE CALIFORNIA COUNTY LASSEN

LOCATION:

SEC. ______ TWP. ______ RGE. ______

OTHER SERVICES: ELECTRIC LOG

PERMANENT DATUM G.L. ELEV. ______

LOG MEASURED FROM G.L. FT. ABOVE PERM. DATUM

DRILLING MEASURED FROM G.L.

ELEV.: K.B. ______ D.F. ______ G.L. ______

DATE	3-13-90		
RUN NO.	ONE		
TYPE LOG	3 ARM CALIPER		
DEPTH-DRILLER	251'		
DEPTH-LOGGER	251'		
BOTTOM LOGGED INTERVAL	249'		
TOP LOGGED INTERVAL	0'		
TYPE FLUID IN HOLE	BENTONITE		
MAX. REC. TEMP., DEG. F.	N/A		
RECORDED BY	ROBERTI		
WITNESSED BY	MYERS		

RUN	BORE-HOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
ONE	5"	SURFACE	251'	NONE			

Remarks:

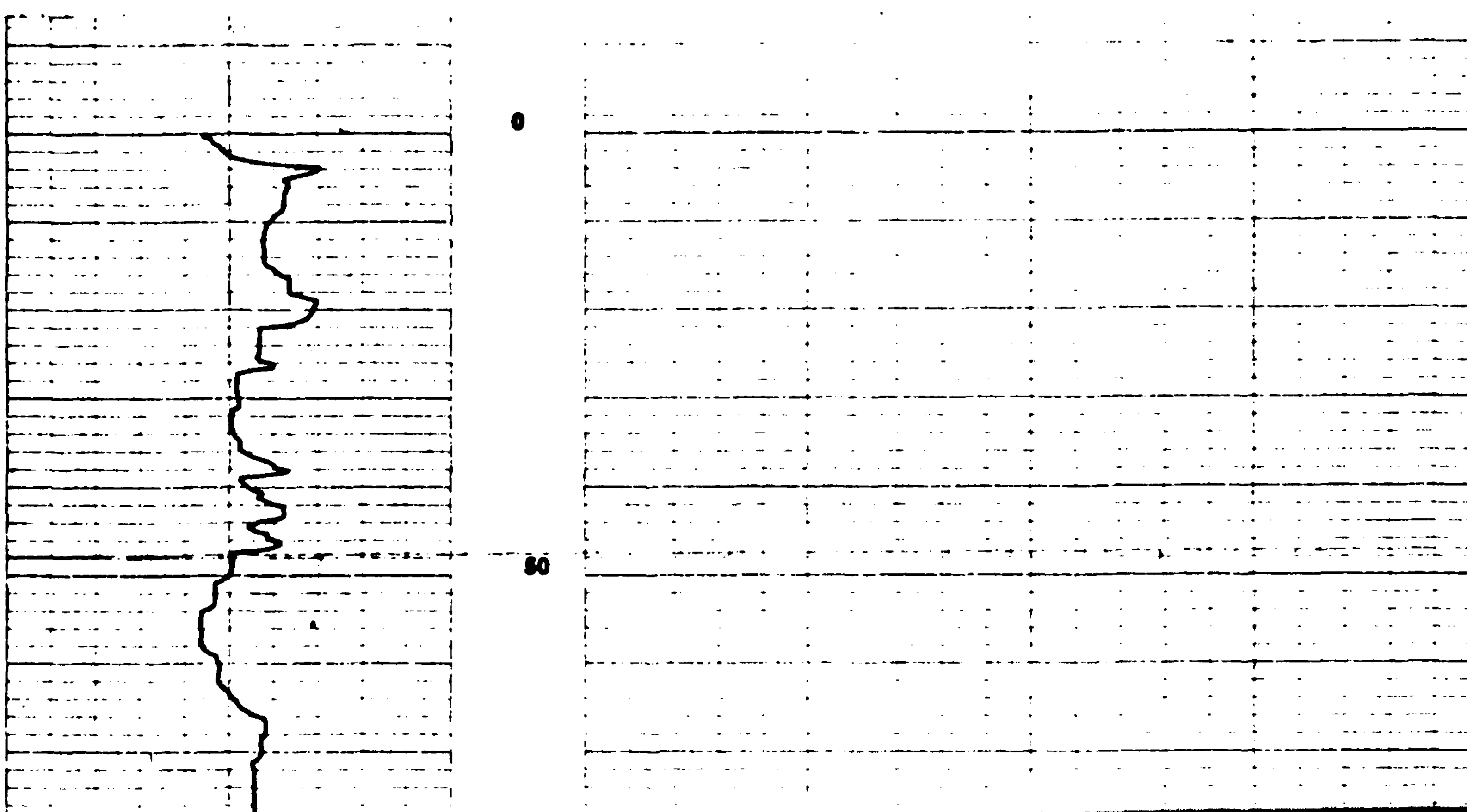
OG

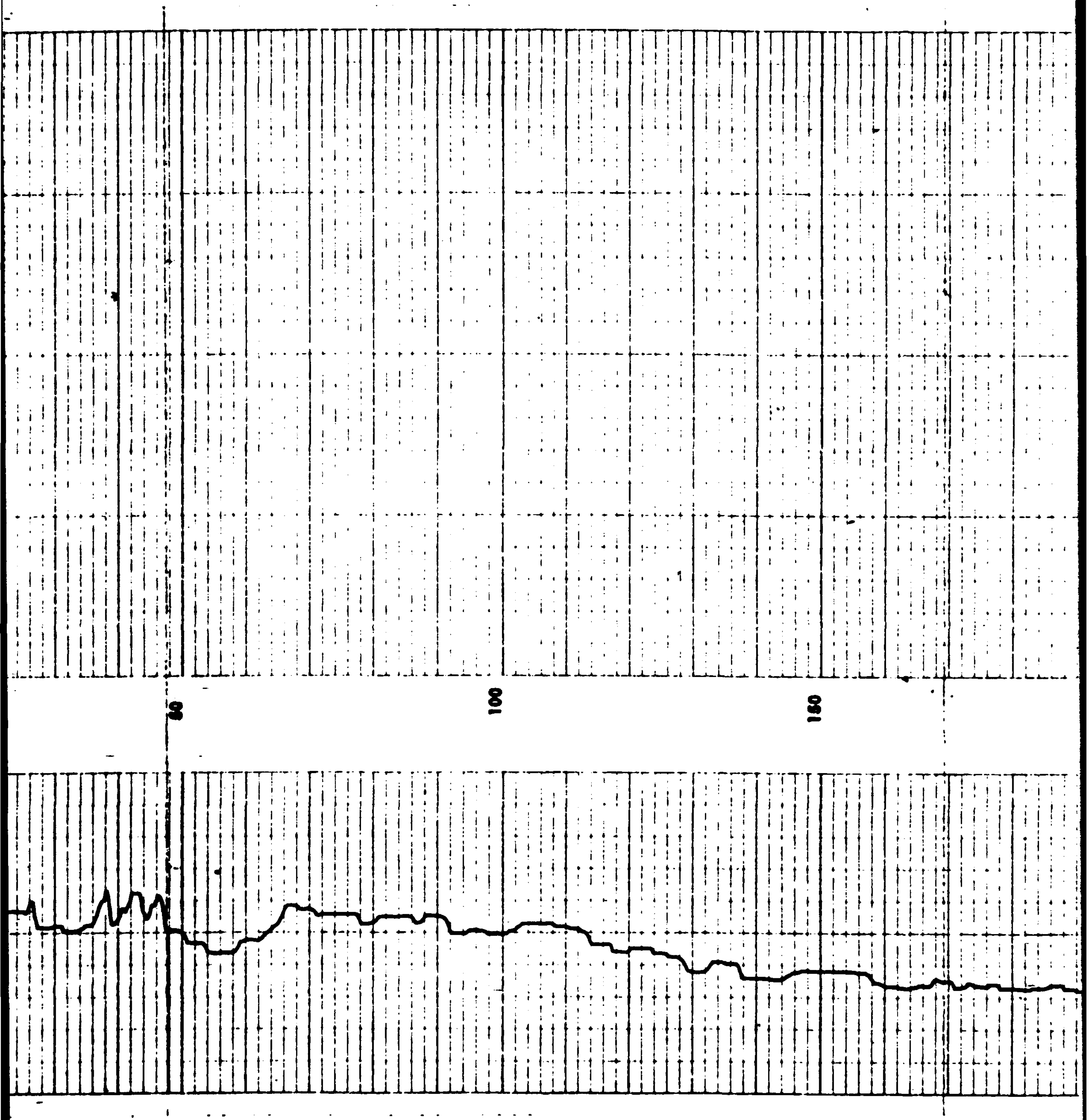
2

Remarks:

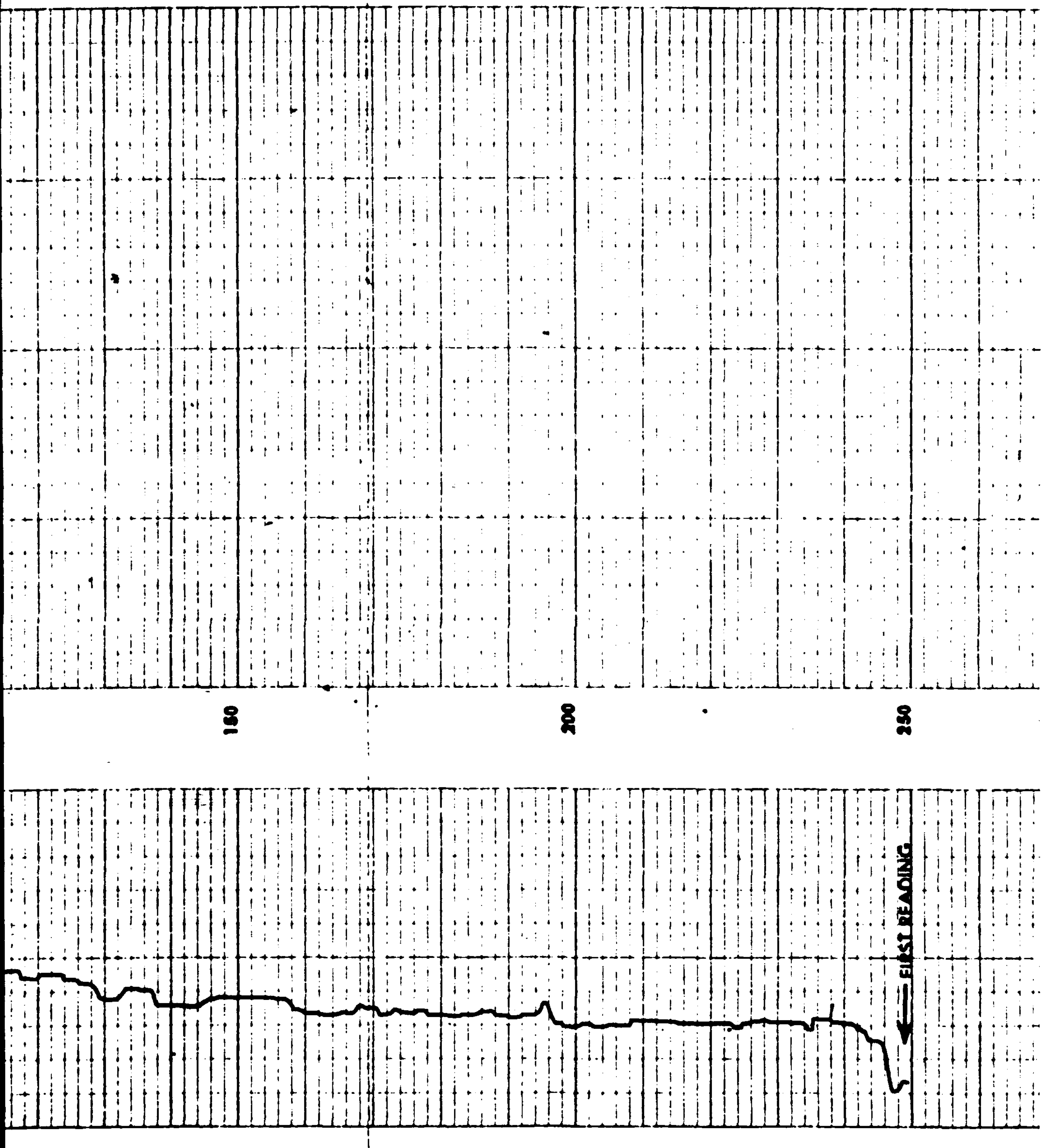
Fold Here

CALIPER HOLE DIAMETER IN INCHES	DEPTHS	
2 12		





3


150
200
250
FIRST READING

welenco

ELECTRIC LOG

FILING NO.

COMPANY JAMES M. MONTGOMERY, CONS. ENG. INC.

WELL DSB - 6

FIELD SIERRA ARMY DEPOT

STATE CALIFORNIA COUNTY LASSEN

LOCATION:

SEC. TWP. RGE.

OTHER SERVICES

CALIPER

Permanent Datum: G.L. Elev.

Log Measured From G.L. Ft. Above Perm. Datum

Drilling Measured From G.L.

Elev.: K.B.

D.F.

G.L.

Date	3-6-90			
Run No.	ONE			
Depth—Driller	250'			
Depth—Logger	250'			
Btm. Log Inter.	249'			
Top Log Inter.	46'			
Casing—Driller	NONE @	@	@	@
Casing—Logger	--			
Bit Size	5"			
Type Fluid in Hole	BENTONITE			
Dens. | Visc.	N/A |	|	|	|
pH | Fluid Loss	N/A | ml	| ml	| ml	| ml
Source of Sample	CIRC.			
R_m @ Meas. Temp.	6.71 @ 75 °F	@ °F	@ °F	@ °F
R_{mf} @ Meas. Temp.	6.71 @ 75 °F	@ °F	@ °F	@ °F
R_{mc} @ Meas. Temp.	N/A @ °F	@ °F	@ °F	@ °F
Source: R_{mf} R_{mc}	M |	|	|	|
R_m @ BHT	N/A @ °F	@ °F	@ °F	@ °F
Time Since Circ.	2 HOURS			
Max. Rec. Temp.	N/A °F	°F	°F	°F
Equip. | Location	SB81 | RENO	|	|	|
Recorded By	ROBERTI			
Witnessed By	MARINAI			

This Heading and Log Conforms To API RP 33

Fold Here

REMARKS

Scale Changes

Type Log	Depth	Scale Up Hole	Scale Down Hole

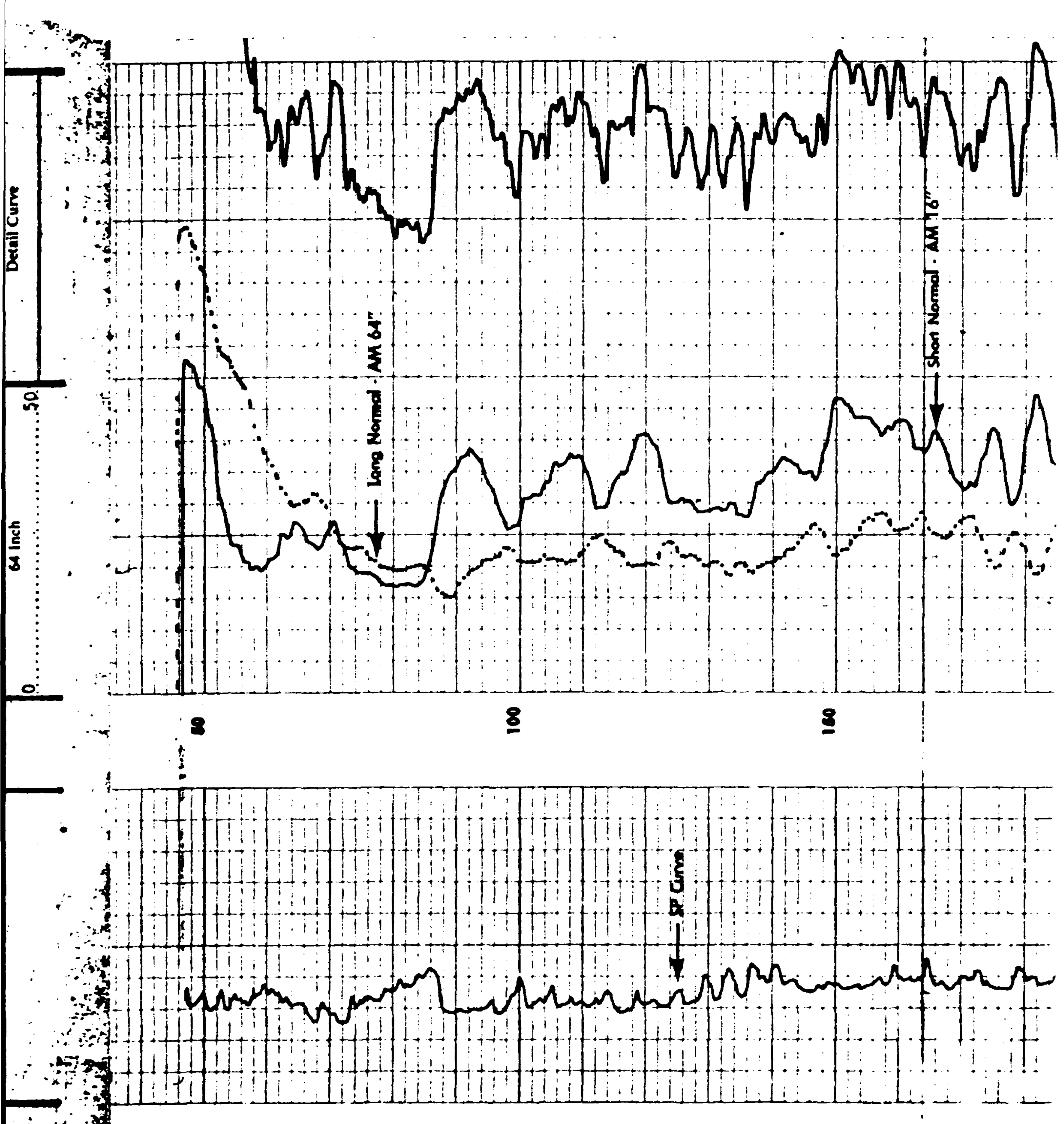
Changes in Mud Type or Additional Samples

Date	Sample No.	Depth—Driller	Type Fluid in Hole	Dens.	Visc.	pH	Fluid Loss
							ml

1

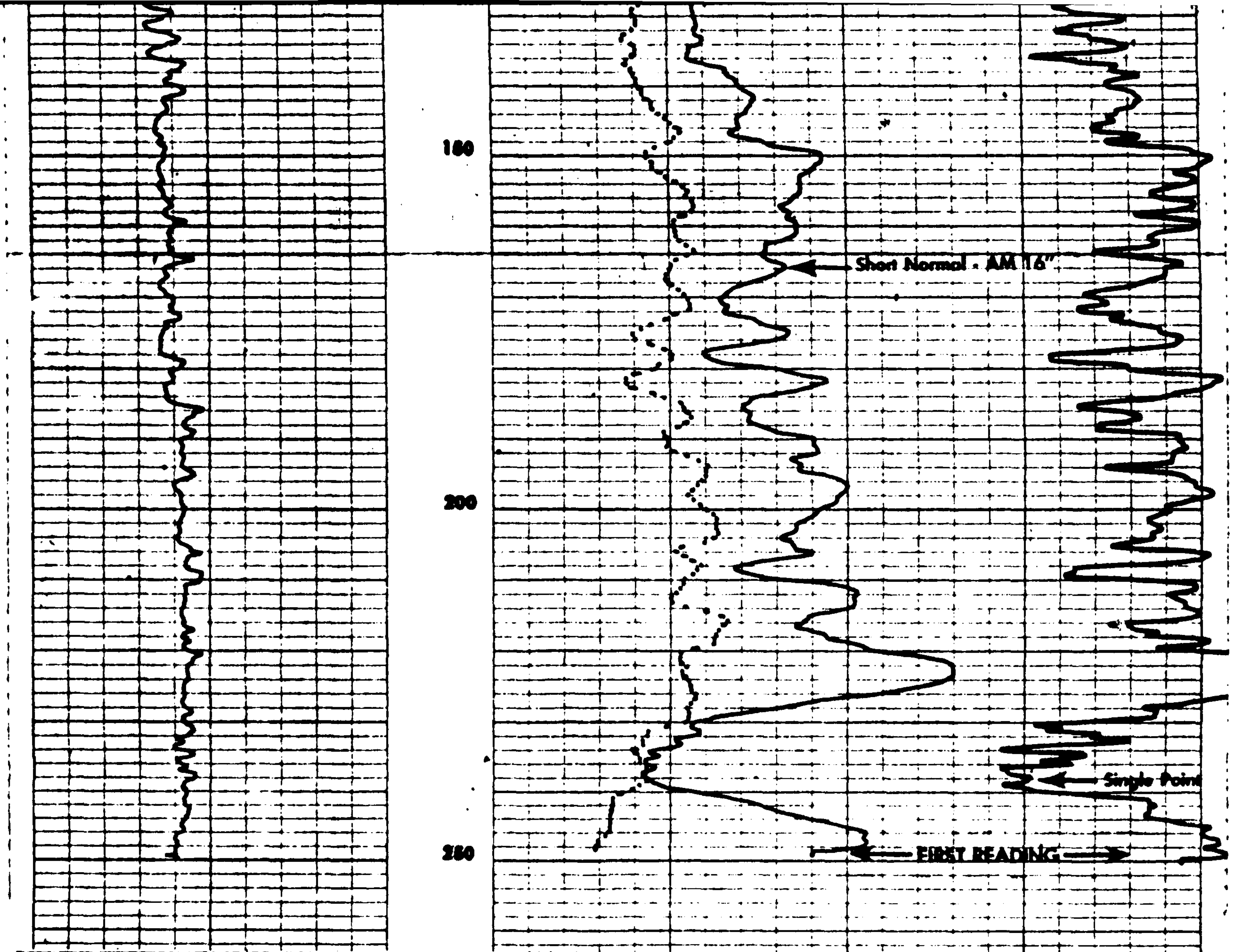
Source of Sample				Equipment Data			
R_m @ Meas. Temp.	@ °F	@ °F	Run No.	Tool Type	Pad Type	Tool Position	Other
R_{mf} @ Meas. Temp.	@ °F	@ °F	ONE	ELECTRIC LOG		FREE	
R_{mc} @ Meas. Temp.	@ °F	@ °F					
Source: R_{mf} | R_{mc}	|	|					
R_m @ BHT	@ °F	@ °F					
R_{mf} @ BHT	@ °F	@ °F					
R_{mc} @ BHT	@ °F	@ °F					

SPONTANEOUS POTENTIAL millivolts	Depths	RESISTIVITY ohms. m²/m	RESISTIVITY ohms. m²/m


Detail Curve
64 Inch
50
0
Long Normal - AM 64"
Short Normal - AM 16"
SP Curve
100

3

4

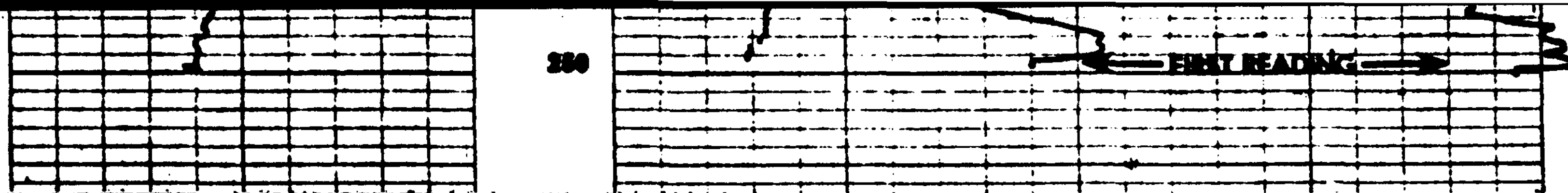


ELECTRIC LOG ANALYSIS

COMPANY: J.M. MONTGOMERY　WELL: DSB-6　BIT SIZE: 5"

FIELD: SIERRA ARMY DEPOT　COUNTY: LASSEN　LOG T.D. 249'

STATE: CALIFORNIA　SEC: ___ TWP: ___ RGE: ___



5

ELECTRIC LOG ANALYSIS

COMPANY: J.M. MONTGOMERY WELL: DSB-6 BIT SIZE: 5"

FIELD: SIERRA ARMY DEPOT COUNTY: LASSEN LOG T.D. 249'

STATE: CALIFORNIA SEC: ____ TWP: ____ RGE: ____

Rm = 6.71 at 75 °F

Rmf = 6.71 at 75 °F

LOG DEPTH	S.P.	Rwe	Rw RANGE (ohm m^2/m)		E.C. RANGE (Umhos)		TDS RANGE (ppm)		REMARKS
			NaCl	$NaHCO_3$	NaCl	$NaHCO_3$	NaCl	$NaHCO_3$	
65'-249'	-5	5.52	5.52	6.49	1811	1541	960	1540	CLASS II

CHEMICAL PROPERTIES	CLASS I (Excellent to Good)	CLASS II (Good to Injurious)	CLASS III (Injurious to Unsatisfactory)
TOTAL DISSOLVED SOLIDS ppm (mg/l)	LESS THAN 700	700 - 2,000	MORE THAN 2,000

THIS INTERPRETATION REPRESENTS OUR BEST JUDGEMENT. NEVERTHELESS, SINCE ALL INTERPRETATIONS ARE OPINIONS BASED SOLELY ON INFERENCES FROM ELECTRICAL AND OTHER MEASUREMENTS, WE CANNOT AND DO NOT GUARANTEE THE ACCURACY OR CORRECTNESS OF THIS INTERPRETATION AND SHALL NOT BE LIABLE FOR ANY COSTS, DAMAGES OR EXPENSES THAT MAY BE INCURRED FROM THIS OR ANY OTHER INTERPRETATION.

DATE: 3-7-90

ROBERTI
WELENCO LOG ANALYST

welenco

ELECTRIC LOG

FILING NO

COMPANY JAMES M. MONTGOMERY, CONS. ENG. INC.

WELL DSB - 3

FIELD SIERRA ARMY DEPOT

STATE CALIFORNIA COUNTY LASSEN

LOCATION:

SEC ______ TWP ______ RGE ______

OTHER SERVICES

GAMMA RAY

CALIPER

Permanent Datum: G.L. , Elev.______

Log Measured From G.L. , ______ Ft. Above Perm. Datum

Drilling Measured From G.L.

Elev.: K.B.______

D.F.______

G.L.______

Date	2-19-90			
Run No.	ONE			
Depth—Driller	251'			
Depth—Logger	250'			
Btm. Log Inter.	249'			
Top Log Inter.	42'			
Casing—Driller	6" @ 5'	@	@	@
Casing—Logger	5'			
Bit Size	5"			
Type Fluid in Hole	BENTONITE			
Dens. | Visc.	N/A	|	|	|
pH | Fluid Loss	N/A | ml	| ml	| ml	| ml
Source of Sample	PIT			
R_m @ Meas. Temp.	3.9 @ 75 °F	@ °F	@ °F	@ °F
R_{mf} @ Meas. Temp.	3.9 @ 75 °F	@ °F	@ °F	@ °F
R_{mc} @ Meas. Temp.	N/A @ °F	@ °F	@ °F	@ °F
Source: R_{mf} | R_{mc}	M |	|	|	|
R_m @ BHT	N/A @ °F	@ °F	@ °F	@ °F
Time Since Circ.	1 HOUR			
Max. Rec. Temp.	N/A °F	°F	°F	°F
Equip. | Location	SB81 | RENO	|	|	|
Recorded By	ROBERTI			
Witnessed By	MARINAI			

This Heading and Log Conform To API RP 31

Fold Here

REMARKS

Scale Changes

Type Log	Depth	Scale Up Hole	Scale Down Hole

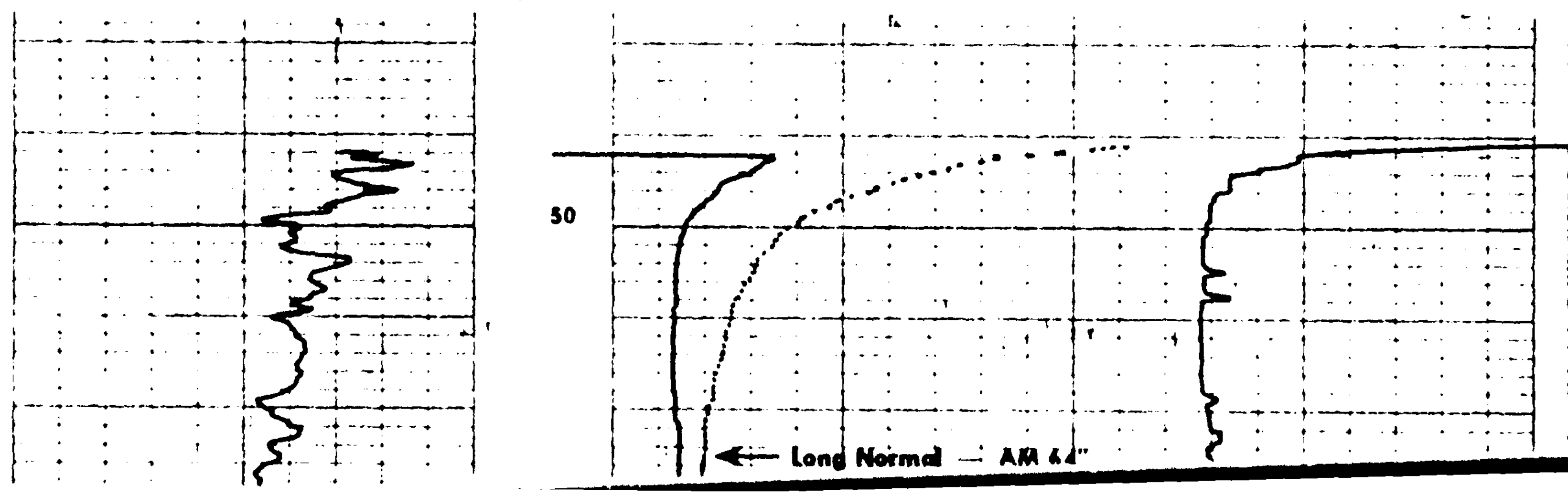
Changes in Mud Type or Additional Samples

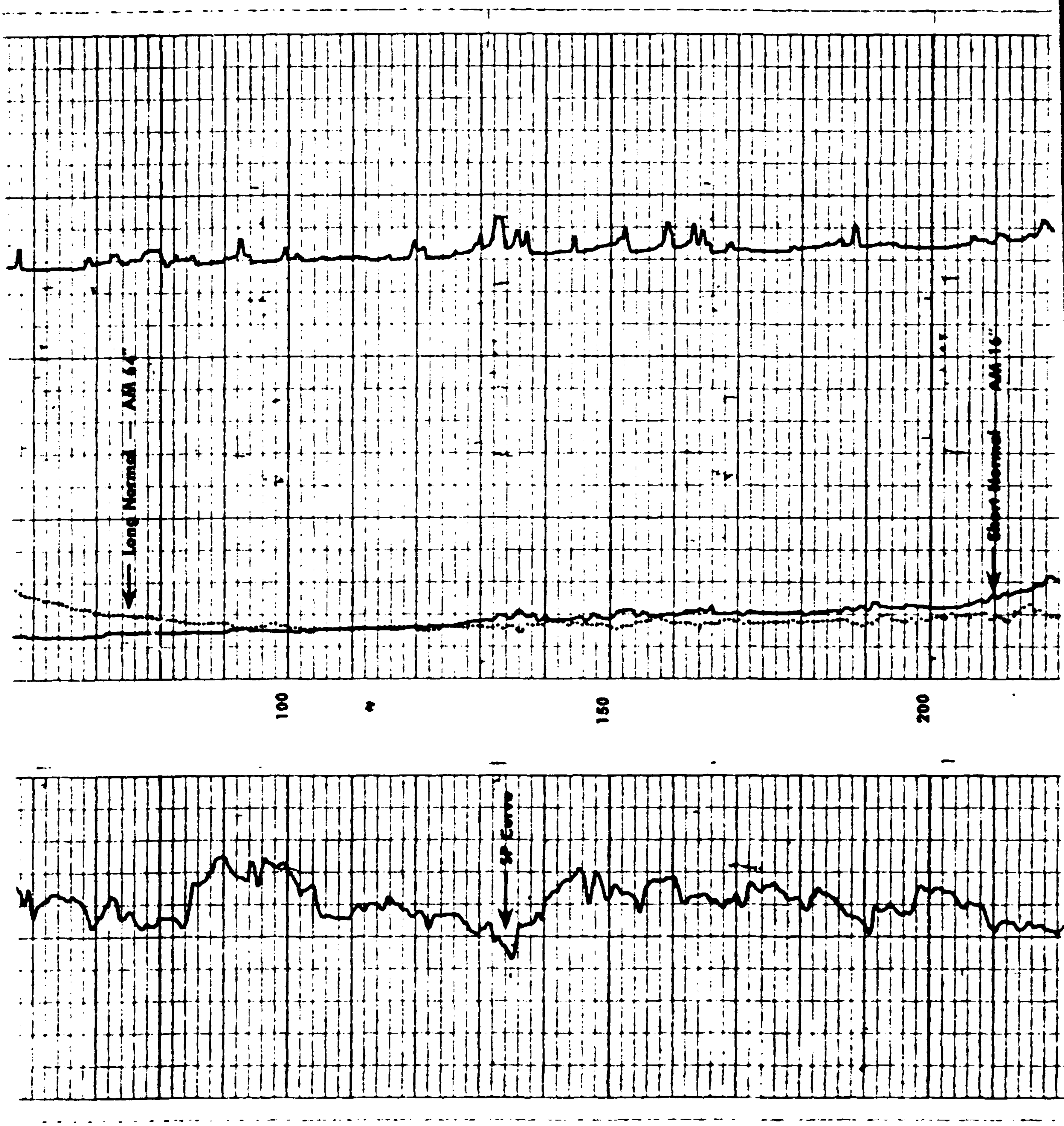
Date | Sample No.	Depth—Driller	Type Fluid in Hole	Dens. | Visc.

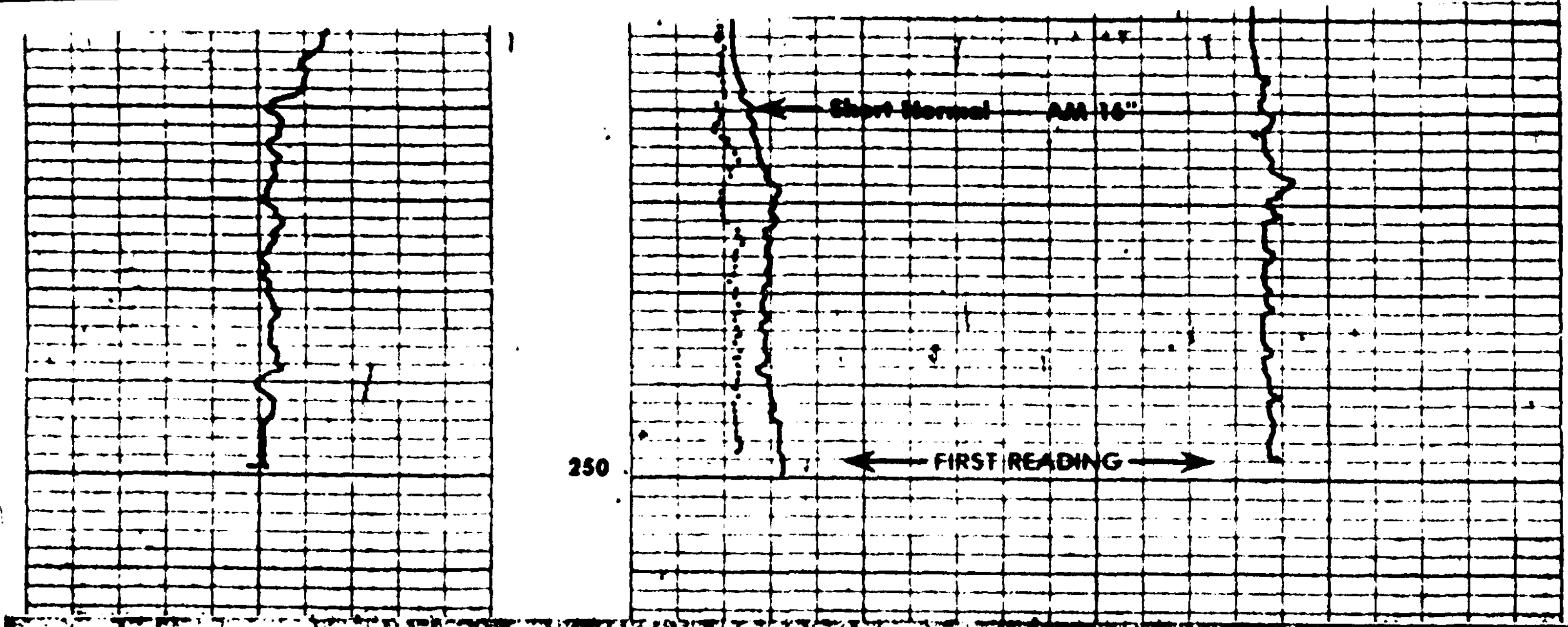
2

Type Fluid in Hole							
Dens. | Visc.	|	|					
ph | Fluid Loss	| ml	|					
Source of Sample			Equipment Data				
R_m @ Meas. Temp.	@ °F	@ °F	Run No.	Tool Type	Pad Type	Tool Position	Other
R_{mf} @ Meas. Temp	@ °F	@ °F	ONE	ELECTRIC LOG		FREE	
R_{mc} @ Meas. Temp.	@ °F	@ °F					
Source: R_{mf} | R_{mc}	|	|					
R_m @ BHT	@ °F	@ °F					
R_{mf} @ BHT	@ °F	@ °F					
R_{mc} @ BHT	@ °F	@ °F					

SPONTANEOUS POTENTIAL millivolts	Depths	RESISTIVITY ohms. m²/m	RESISTIVITY ohms. m²/m
5 - |←→| +		SHORT NORMAL 16 Inch 0 — 10	
		LONG NORMAL 64 Inch 0 — 10	RESISTANCE Detail Curve




Long Normal — AM 64″
Short Normal
AM 16″
100
150
200
SP Curve



17

ELECTRIC LOG, ANALYSIS

COMPANY: J.M. MONTGOMERY   WELL: DSB - 3   BIT SIZE: 5"

FIELD: SIERRA ARMY DEPOT   COUNTY: LASSEN   LOG T.D. 250'

STATE: CALIFORNIA   SEC: ____ TWP: ____ RGE: ____

Rm = 3.9 at 75 °F

Rmf = 3.9 at 75 °F

LOG DEPTH	S.P.	Rwe	Rw RANGE (ohm m^2/m)		E.C. RANGE (Umhos)		TDS RANGE (ppm)		REMARKS
			NaCl	$NaHCO_3$	NaCl	$NaHCO_3$	NaCl	$NaHCO_3$	
70'-249'	-8	3.0	3.0	3.5	3333	2857	1770	2860	CLASS 2 OR 3

CHEMICAL PROPERTIES	CLASS I (Excellent to Good)	CLASS II (Good to Injurious)	CLASS III (Injurious to Unsatisfactory)
TOTAL DISSOLVED SOLIDS ppm (mg/l)	LESS THAN 700	700 - 2,000	MORE THAN 2,000

THIS INTERPRETATION REPRESENTS OUR BEST JUDGEMENT. NEVERTHELESS, SINCE ALL INTERPRETATIONS ARE OPINIONS BASED SOLELY ON INFERENCES FROM ELECTRICAL AND OTHER MEASUREMENTS, WE CANNOT AND DO NOT GUARANTEE THE ACCURACY OR CORRECTNESS OF THIS INTERPRETATION AND SHALL NOT BE LIABLE FOR ANY COSTS, DAMAGES OR EXPENSES THAT MAY BE INCURRED FROM THIS OR ANY OTHER INTERPRETATION.

DATE: 2-20-90

ROBERTI
WELENCO LOG ANALYST

FILING NO.

COMPANY JAMES M. MONTGOMERY, CONS. ENG. INC.

WELL DSB - 2

FIELD SIERRA ARMY DEPOT

STATE CALIFORNIA COUNTY LASSEN

LOCATION:

SEC. ____ TWP ____ RGE ____

OTHER SERVICES:

CALIPER SURVEY

Permanent Datum: G.L. , Elev. ____

Log Measured From G.L. , ____ Ft. Above Perm. Datum

Drilling Measured From G.L.

Elev.: K.B. ____
D.F. ____
G.L. ____

Date	3-13-90			
Run No.	ONE			
Depth-Driller	251'			
Depth-Logger	251'			
Btm. Log Interval	250'			
Top Log Interval	45'			
Casing-Driller	NONE @	@	@	@
Casing-Logger	--			
Bit Size	5"			
Type Fluid in Hole	BENTONITE			
Dens. | Visc.	N/A	|	|	|
pH | Fluid Loss	N/A | ml	| ml	| ml	| ml
Source of Sample	CIRC.			
Rm @ Meas. Temp.	3.16 @ 75 °F	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	3.16 @ 75 °F	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	N/A @ °F	@ °F	@ °F	@ °F
Source: Rmf | Rmc	M |	|	|	|
Rm @ BHT	N/A @ °F	@ °F	@ °F	@ °F
Time Since Circ.	2 HOURS			
Max. Rec. Temp.	N/A °F	°F	°F	°F
Equip. | Location	SB81 | RENO	|	|	|
Recorded By	ROBERTI			
Witnessed By	MYERS			

Changes in Mud Type or Additional Samples		
Date | Sample No.		
Depth—Driller		
Type Fluid in Hole		
Dens. | Visc.		
ph | Fluid Loss	ml	
Source of Sample		
R_m @ Meas. Temp.	@ °F	@ °F
R_{mf} @ Meas. Temp.	@ °F	@ °F
R_{mc} @ Meas. Temp.	@ °F	@ °F
Source: R_{mf} | R_{mc}		
R_m @ BHT	@ °F	@ °F
R_{mf} @ BHT	@ °F	@ °F
R_{mc} @ BHT	@ °F	@ °F

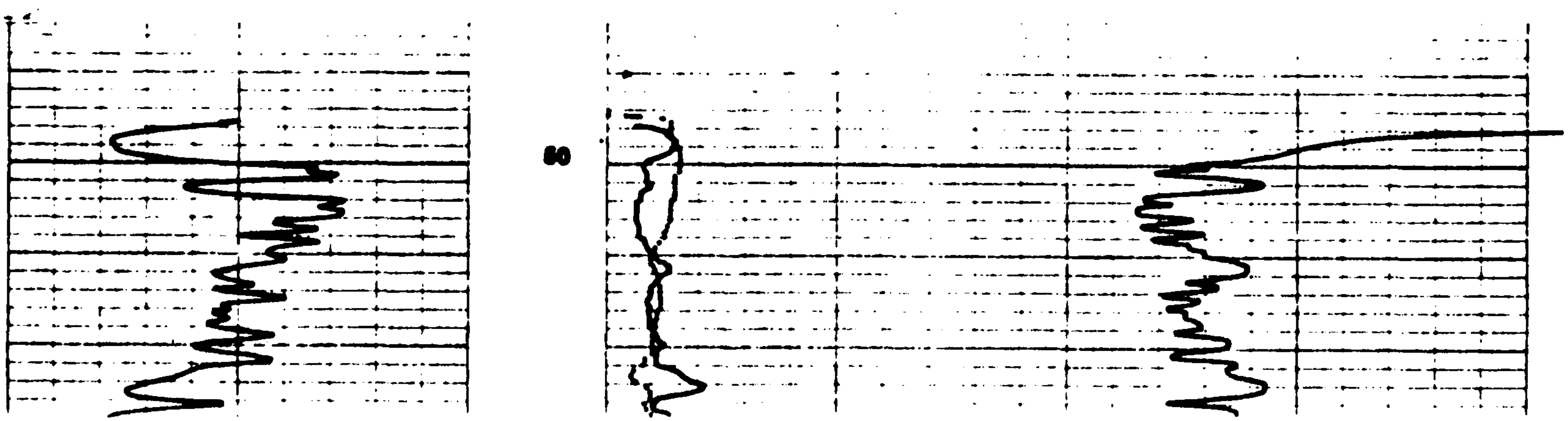
Scale Changes

Type Log	Depth	Scale Up Hole	Scale Down Hole

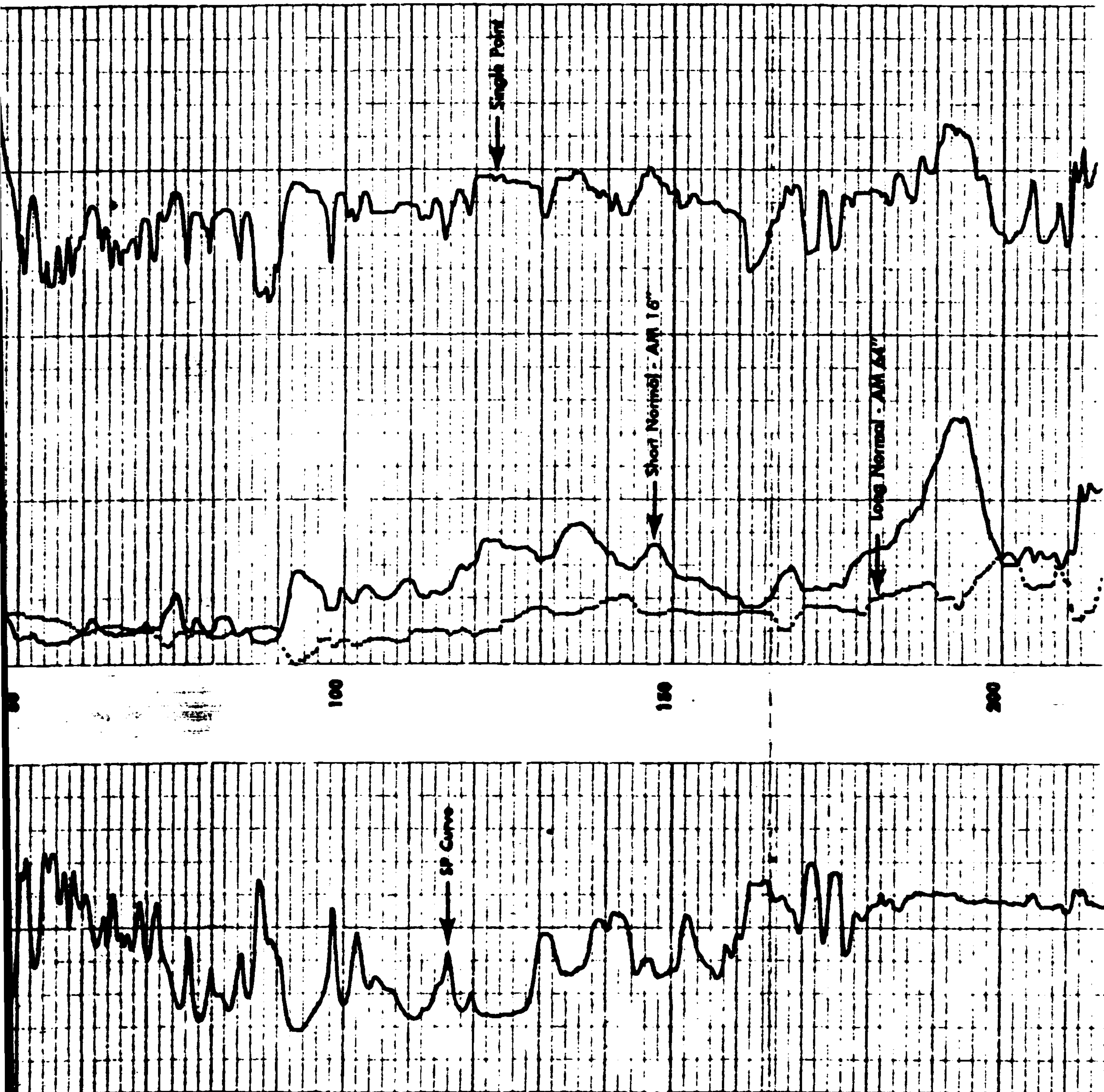
Equipment Data

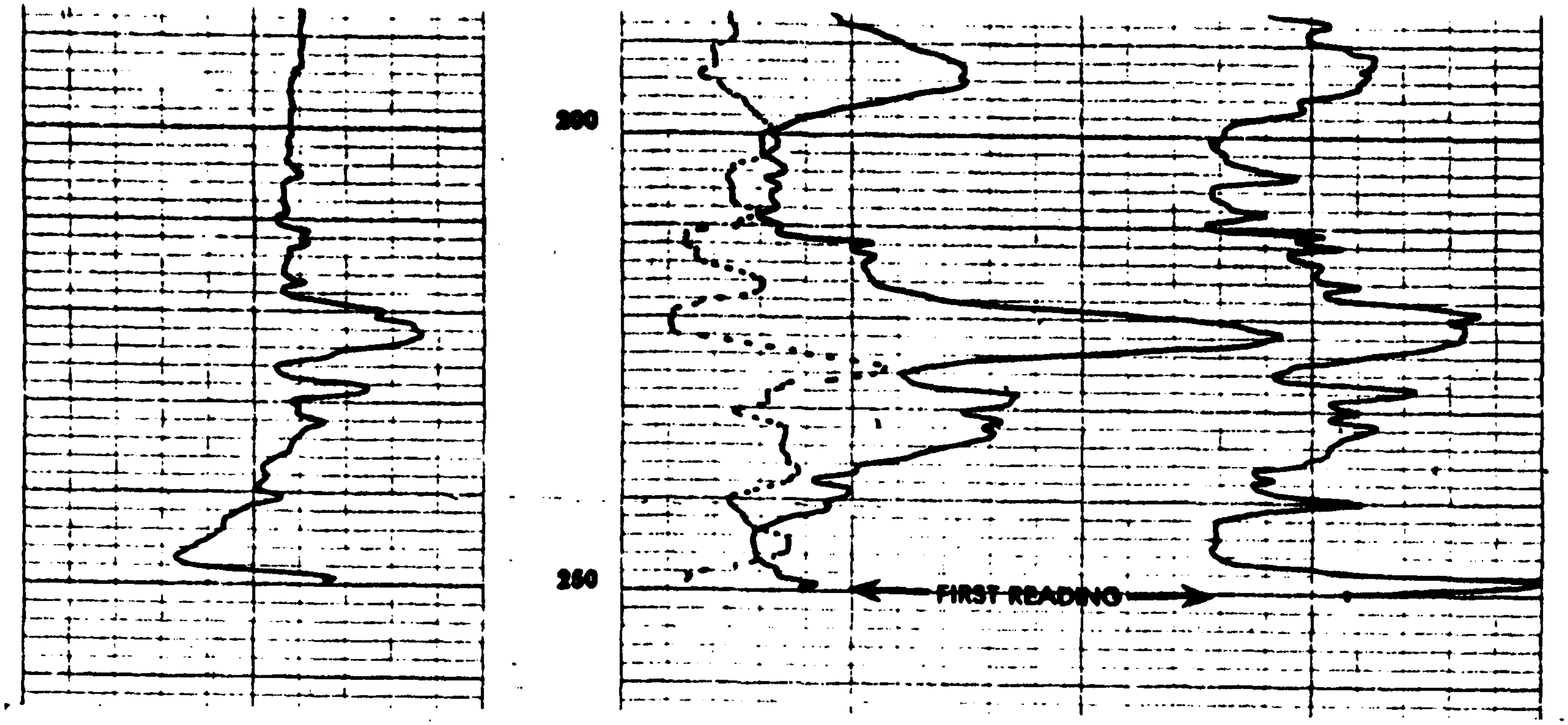
Run No.	Tool Type	Pad Type	Tool Position	Other
ONE	ELECTRIC LOG		FREE	

SPONTANEOUS POTENTIAL millivolts	Depths	RESISTIVITY ohms. m²/m	RESISTIVITY ohms. m²/m
5 − ⟷ +		SHORT NORMAL 16 Inch 0 — 20	
		LONG NORMAL 64 Inch 0 — 20	RESISTANCE Detail Curve



2


Single Point
Short Normal - AM 16"
Long Normal - AM 64"
SP Curve
100
150
200



ELECTRIC LOG ANALYSIS

COMPANY: J.M. MONTGOMERY   WELL: DSB - 2   BIT SIZE: 5"

FIELD: SIERRA ARMY DEPOT   COUNTY: LASSEN   LOG T.D. 250'

STATE: CALIFORNIA   SEC: ____ TWP: ____ RGE: ____

Rm =3.14 at 75 °F

Rmf 3.14 at 75 °F

LOG DEPTH	S.P.	Rwe	Rw RANGE (ohm m^2/m)		E.C. RANGE (Umhos)		TDS RANGE (ppm)		REMARKS
			NaCl	$NaHCO_3$	NaCl	$NaHCO_3$	NaCl	$NaHCO_3$	
50' - 175'	-23	1.48	1.48	1.75	6757	5714	3580	5710	CLASS III
175' - 250'	20	6.02	6.02	7.09	1661	1410	880	1410	CLASS II

50' - 175'	-23	1.48	1.48	1.75	6757	5714	3580	5710	CLASS III
175' - 250'	20	6.02	6.02	7.09	1661	1410	880	1410	CLASS II

CHEMICAL PROPERTIES	CLASS I (Excellent to Good)	CLASS II (Good to Injurious)	CLASS III (Injurious to Unsatisfactory)
TOTAL DISSOLVED SOLIDS ppm (mg/l)	LESS THAN 700	700 - 2,000	MORE THAN 2,000

THIS INTERPRETATION REPRESENTS OUR BEST JUDGEMENT. NEVERTHELESS, SINCE ALL INTERPRETATIONS ARE OPINIONS BASED SOLELY ON INFERENCES FROM ELECTRICAL AND OTHER MEASUREMENTS, WE CANNOT AND DO NOT GUARANTEE THE ACCURACY OR CORRECTNESS OF THIS INTERPRETATION AND SHALL NOT BE LIABLE FOR ANY COSTS, DAMAGES OR EXPENSES THAT MAY BE INCURRED FROM THIS OR ANY OTHER INTERPRETATION.

DATE: 3-14-90

ROBERTI
WELENCO LOG ANALYST

welenco

Caliper Survey

COMPANY	JAMES M. MONTGOMERY, CONS. ENG. INC.
WELL	DSB - 1
FIELD	SIERRA ARMY DEPOT
STATE	CALIFORNIA COUNTY LASSEN

LOCATION:

SEC. ____ TWP. ____ RGE. ____

OTHER SERVICES:

ELECTRIC LOG

PERMANENT DATUM	G.L.	ELEV.	ELEV.: K.B.
LOG MEASURED FROM	G.L.	FT. ABOVE PERM. DATUM	D.F.
DRILLING MEASURED FROM	G.L.		G.L.

DATE	3-3-90		
RUN NO.	ONE		
TYPE LOG	3 ARM CALIPER		
DEPTH-DRILLER	250'		
DEPTH-LOGGER	250'		
BOTTOM LOGGED INTERVAL	249'		
TOP LOGGED INTERVAL	0'		
TYPE FLUID IN HOLE	BENTONITE		
MAX. REC. TEMP., DEG. F.	N/A		
RECORDED BY	ROBERTI		
WITNESSED BY	MARINAI		

RUN	BORE-HOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	5"	SURFACE	250'	NONE			

Remarks:

Fold Here

ENG. INC.

N

OTHER SERVICES:

ELECTRIC LOG

ELEV.: K.B.

D.F.

G.L.

FROM | TO

Remarks:

Fold Here

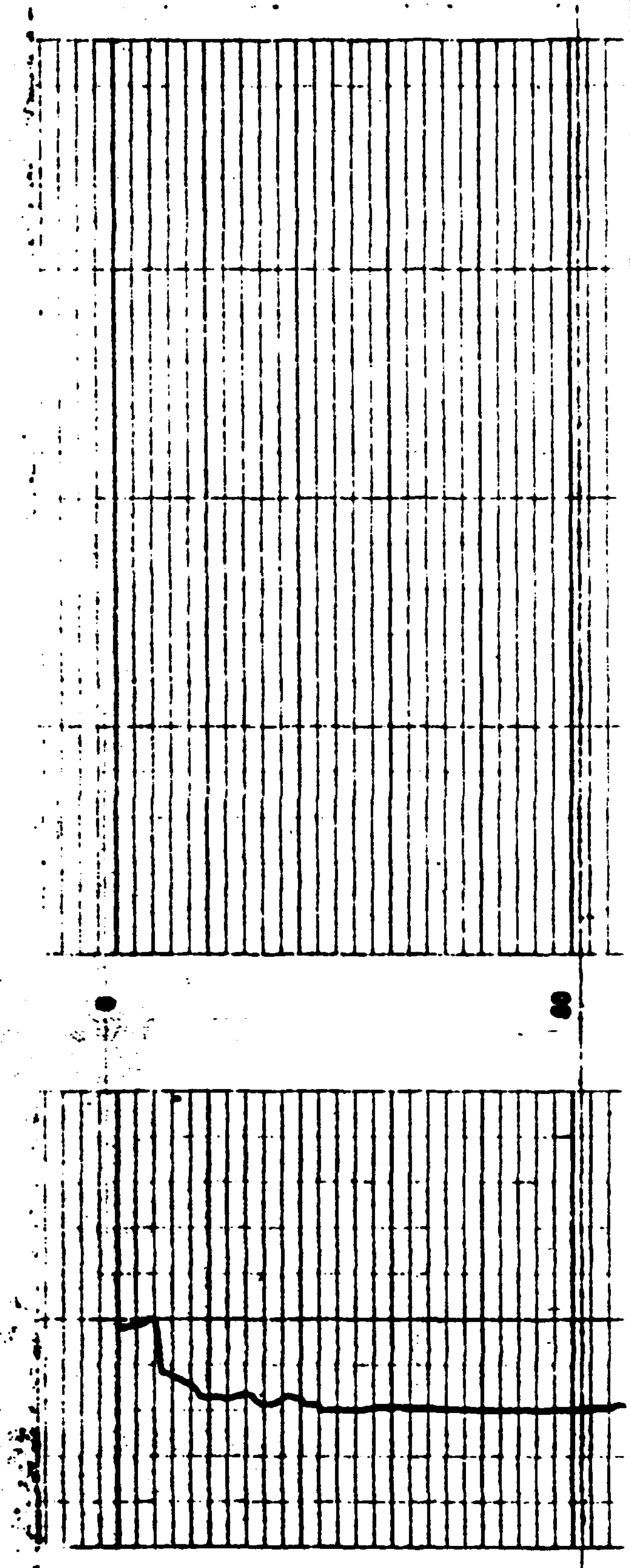
DEPTHS

CALIPER

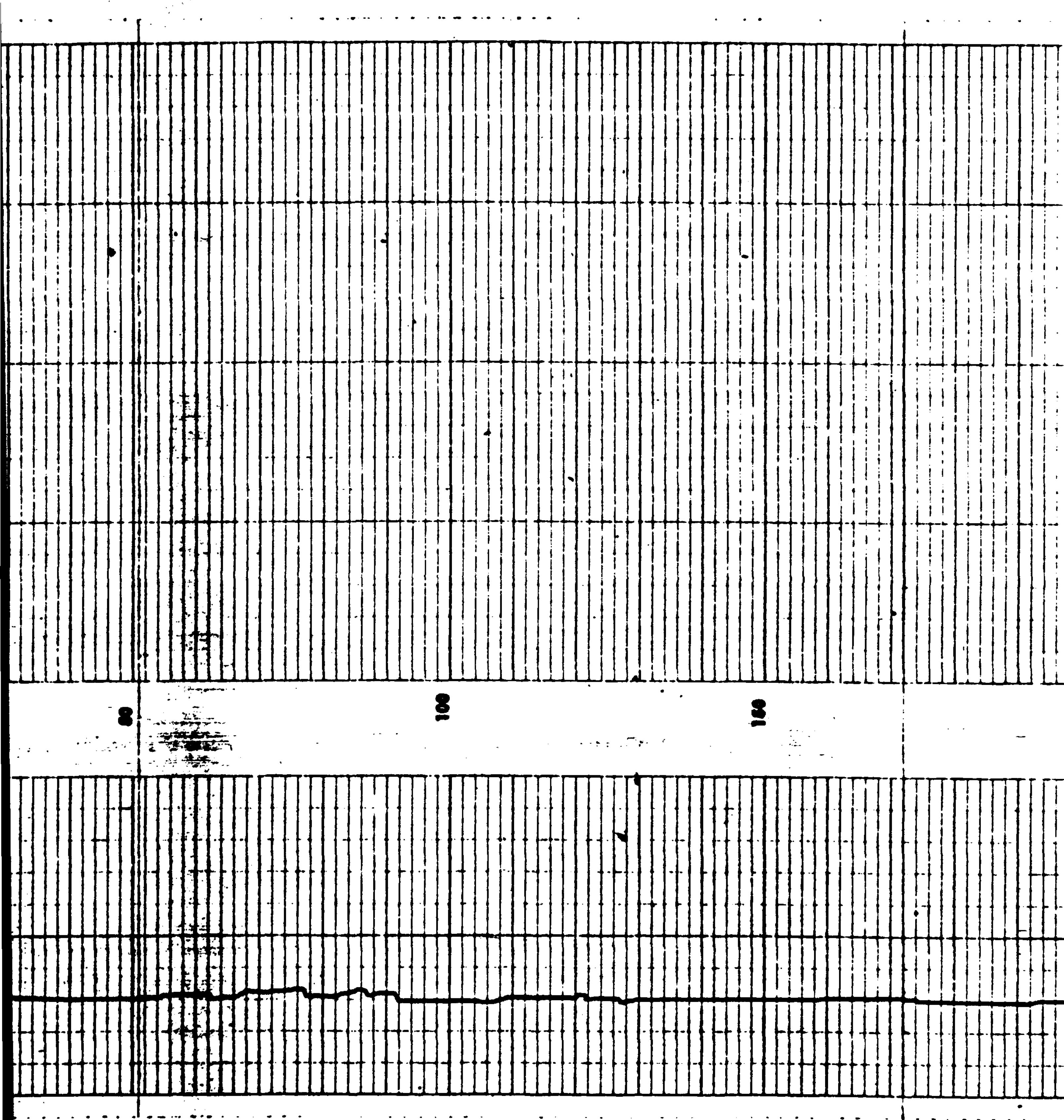
HOLE DIAMETER IN INCHES

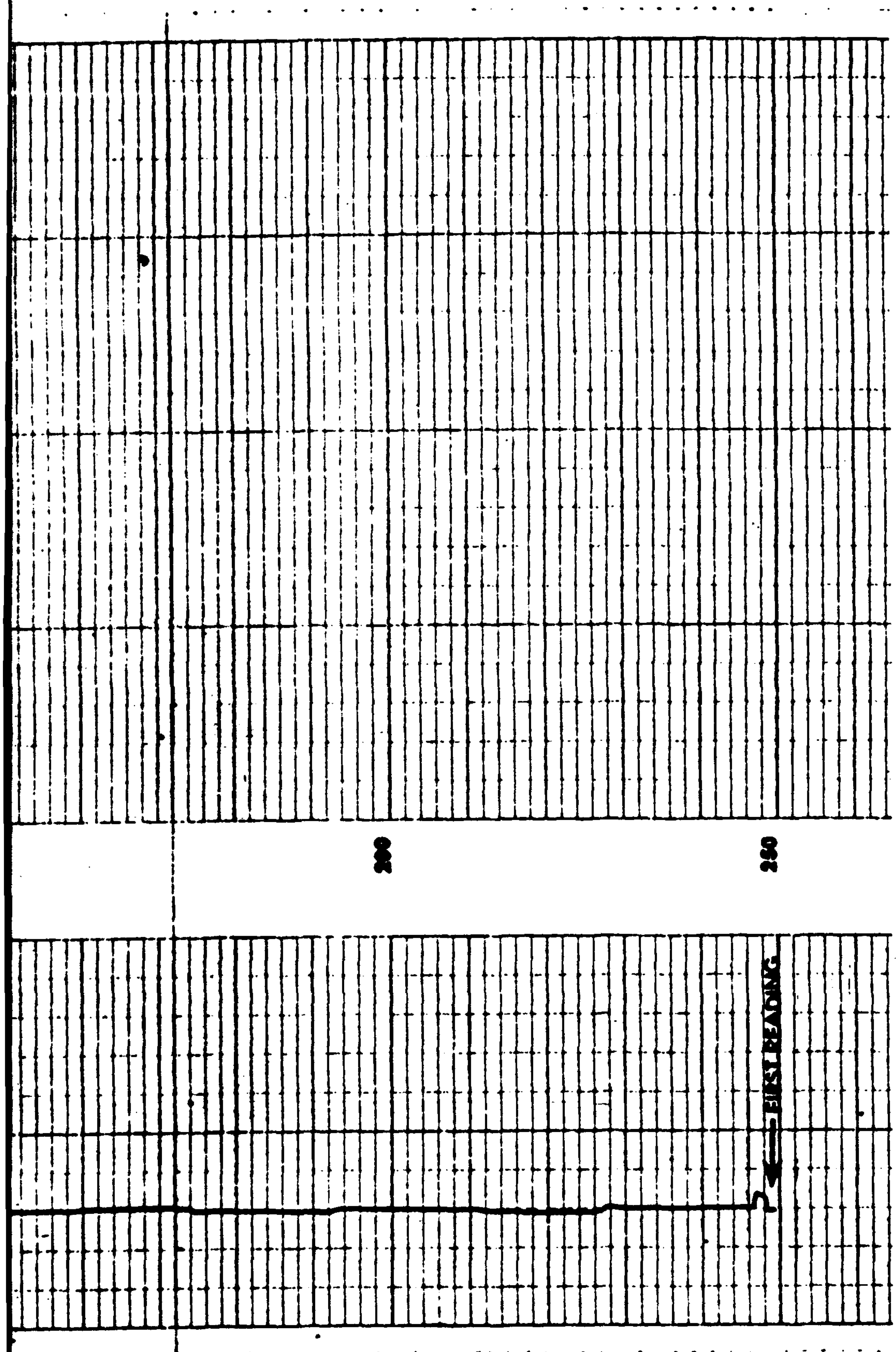
12

2



2


100


200
250
FIRST READING

welenco

Caliper Survey

COMPANY JAMES M. MONTGOMERY, CONS. ENG. INC.

WELL DSB - 5

FIELD SIERRA ARMY DEPOT

STATE CALIFORNIA COUNTY LASSEN

LOCATION: SKEET RANGE

SEC. TWP. RGE.

OTHER SERVICES: ELECTRIC LOG

PERMANENT DATUM G.L. ELEV.

LOG MEASURED FROM G.L. FT. ABOVE PERM. DATUM

DRILLING MEASURED FROM G.L.

ELEV.: K.B.

D.F.

G.L.

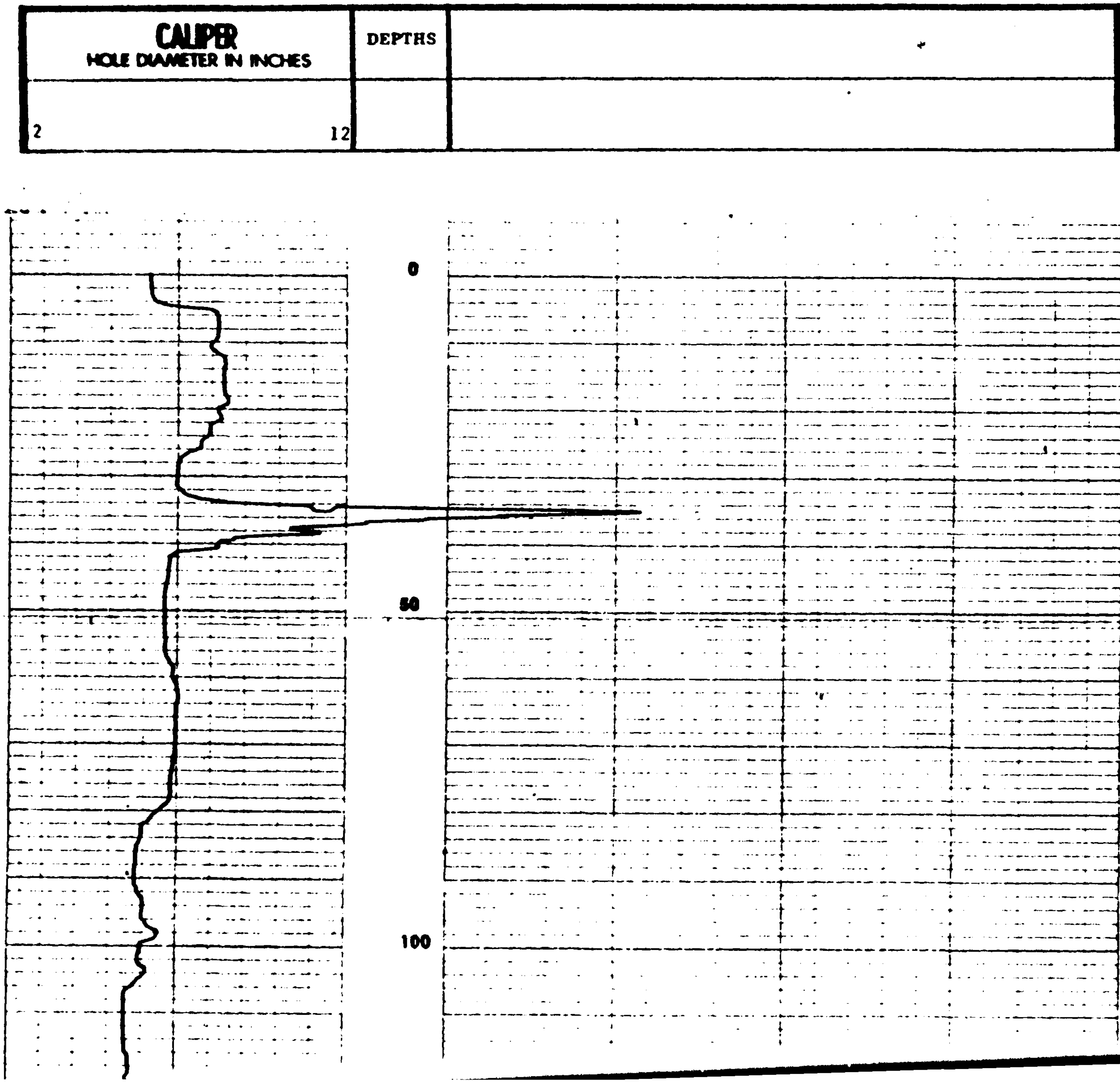
DATE	3-1-90		
RUN NO.	ONE		
TYPE LOG	3 ARM CALIPER		
DEPTH-DRILLER	255'		
DEPTH-LOGGER	255'		
BOTTOM LOGGED INTERVAL	250'		
TOP LOGGED INTERVAL	0'		
TYPE FLUID IN HOLE	BENTONITE		
MAX. REC. TEMP., DEG. F.	N/A		
RECORDED BY	ROBERTI		
WITNESSED BY	MYERS		

RUN	BORE-HOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	5"	5'	255'	6"	COND.	SURFACE	5'

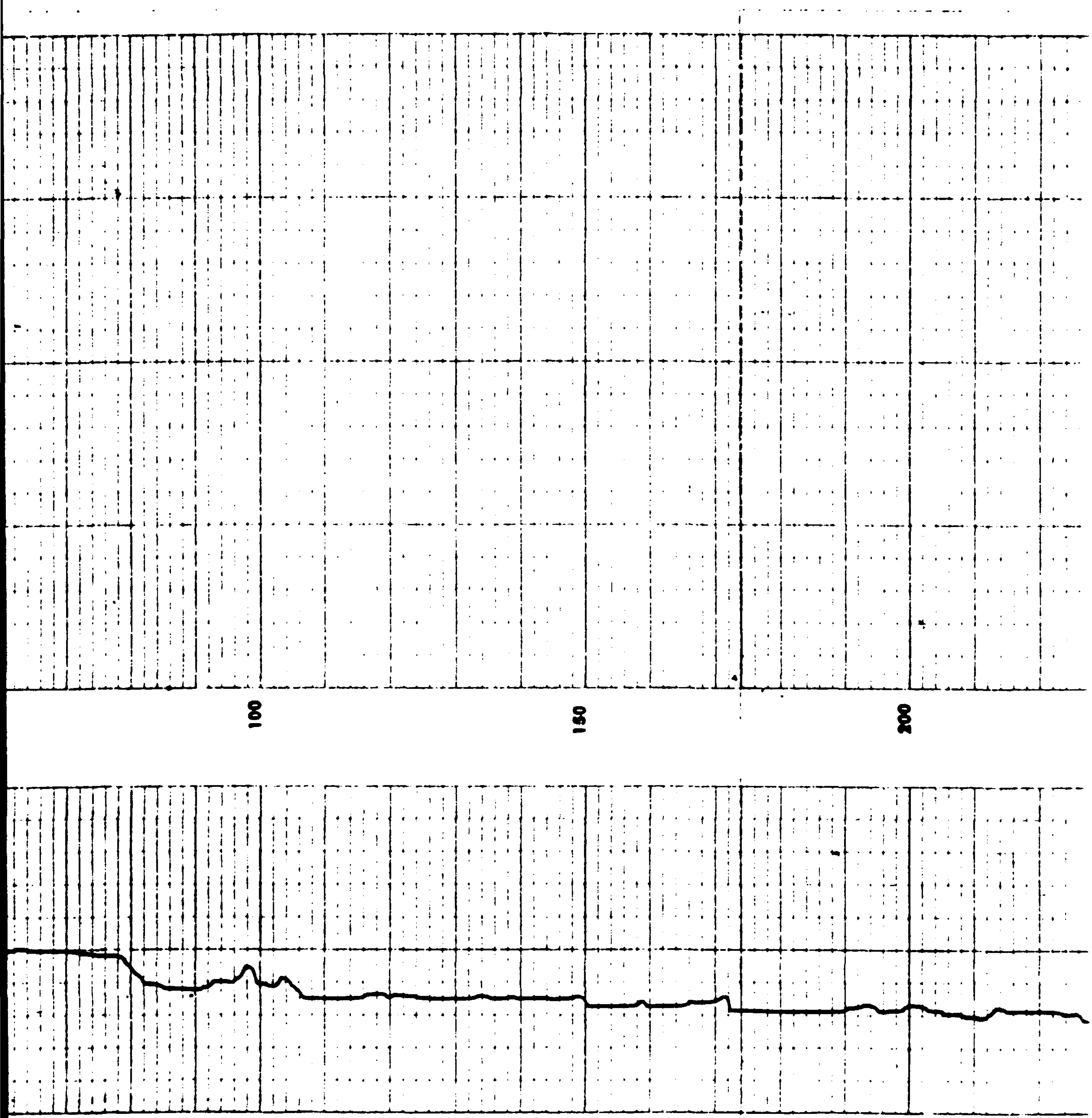
Fold Here

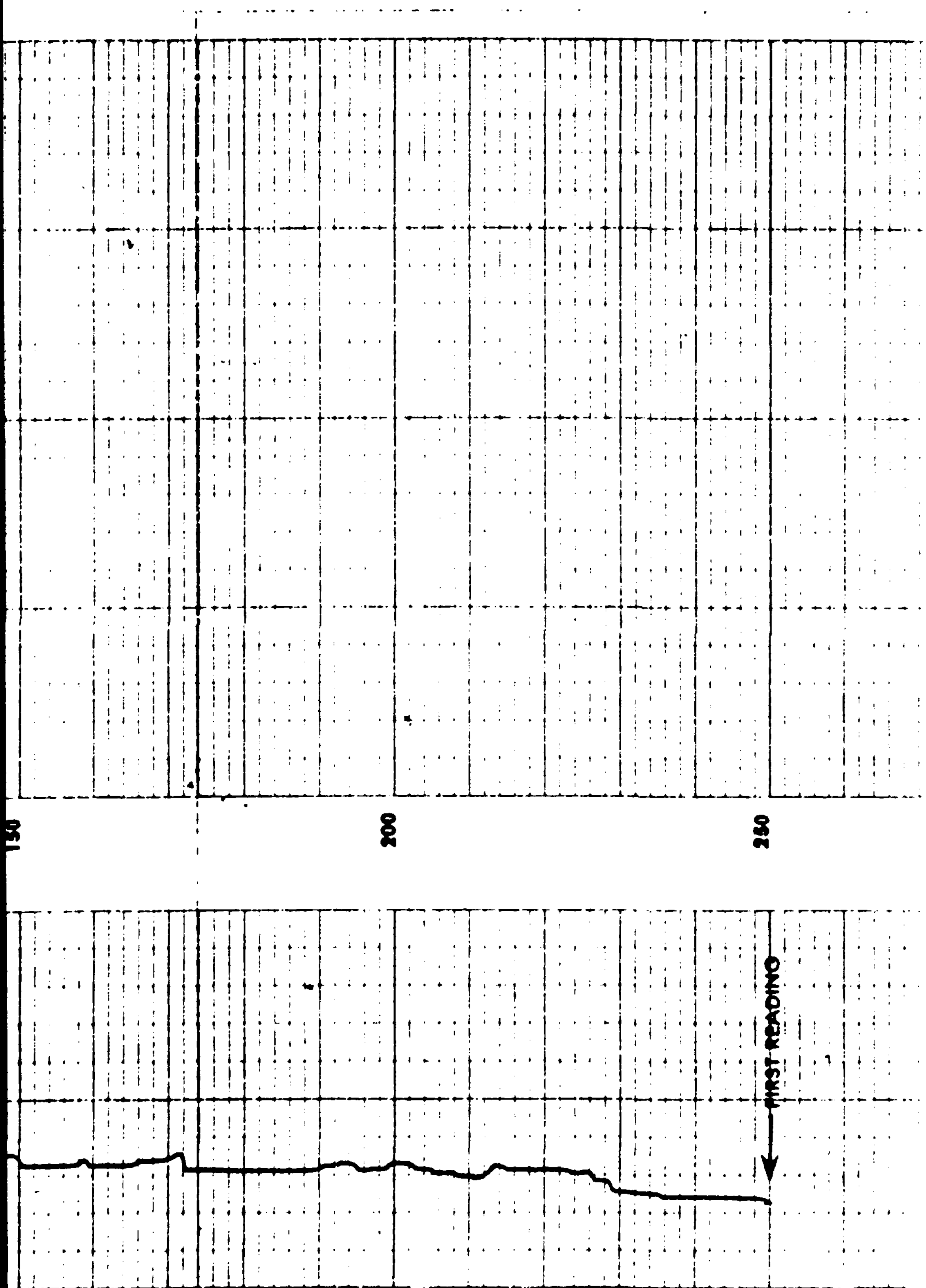
Remarks:

Fold Here



2


100
150
200


150
200
250
FIRST READING

Appendix I

Groundwater Sampling Program

JMM James M. Montgomery
Consulting Engineers Inc.

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD | JOB NO. 2573.0040 | DATE 6/17/90

SAMPLE LOCATION I.D.: ALFIMWA | LOCATION ACTIVITY START: 730 END: 9:00

WATER LEVEL / WELL DATA

WELL DEPTH: 105.07 FT
- ☑ MEASURED
- ☐ HISTORICAL
- ☐ TOP OF WELL
- ☑ TOP OF CASING
- ☐

CASING STICK-UP (FROM GROUND): 1' FT

WATER DEPTH: 91.31 FT

WELL MATERIAL:
- ☑ PVC
- ☐ SS
- ☐

WELL LOCKED?
- ☑ YES
- ☐ NO

WELL DIA.
- ☐ 2 INCH
- ☑ 4 INCH
- ☐ 6 INCH
- ☐

WATER LEVEL EQUIP. USED:
- ☑ ELECT.COND.PROBE
- ☐ FLOAT ACTIVATED
- ☐ PRESS. TRANSDUCER
- ☐

HEIGHT OF WATER COLUMN: 3.76 FT x
- ☐ .16 GAL/FT (2 IN.)
- ☑ .65 GAL/FT (4 IN.)
- ☐ 1.5 GAL/FT (6 IN.)
- ☐ ___ GAL/FT (___ IN.)

= 8.99 GAL/VOL

Gaulus ... We... Vol: 160 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
- PROT. CASING SECURE ☑
- CONCRETE COLLAR INTACT ☑
- OTHER

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	Grudfos 3" ...
☐	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam cleaned bailer, pump PVC flow valve

FIELD ANALYSIS DATA

AMBIENT AIR VOA ___ PPM | WELL MOUTH ___ PPM | FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 20 GAL	@ 100 GAL	@ 160 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C	12.5	13	12.5		
pH, units	7.49	7.61	7.50		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	890	890	900		

SAMPLE OBSERVATIONS
- ☐ TURBID
- ☐ COLORED
- ☐ CLOUDY
- ☑ CLEAR
- ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD | JOB NO. 2573.0040 | DATE 4/17/90

SAMPLE LOCATION I.D.: ALF2MWA | LOCATION ACTIVITY START: 0939 END: 1047

WATER LEVEL / WELL DATA

WELL DEPTH: 109.22 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______

CASING STICK-UP (FROM GROUND): 1'9" FT

WATER DEPTH: 87.51 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP. USED: ☑ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 21.71 FT × ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 14.18 GAL/VOL

TOTAL GAL PURGED: Well vol. = Gallons: 260

WELL INTEGRITY: YES / NO
PROT. CASING SECURE ☑ YES
CONCRETE COLLAR INTACT ☑ YES
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR: PURGING / SAMPLING)

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	Grundfos 3 Horse
☐	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam Cleaned gallon pump PVC Slow valve

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM — WELL MOUTH ____ PPM

FIELD DATA COLLECTED: ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 10 GAL	@ 100 GAL	@ 260 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C	14°	14°	15°		
pH, units	7.41	7.35	7.27		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1150	1150	1100		

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☐ CLOUDY ☑ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES.

SIGNATURE OF SAMPLER: John [illegible]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SAD | JOB NO. 2575.0010 | DATE 4/17 90

SAMPLE LOCATION I.D. ALF3MUA | LOCATION ACTIVITY START: 1308 END: 1450

WATER LEVEL / WELL DATA

WELL DEPTH 107.65 FT ☑ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☑ TOP OF CASING ☐ ________

CASING STICK-UP (FROM GROUND) 1'11" FT

WATER DEPTH 95.45 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ________

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ________

WATER LEVEL EQUIP USED: ☑ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ________

HEIGHT OF WATER COLUMN 12.20 FT x ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 7.97 GAL/VOL

well vol. [illegible] TOTAL GAL PURGED 80

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☑ ☐
CONCRETE COLLAR INTACT ☑ ☐
OTHER ________

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR:

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	Grundfos 3 hurst
☐	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	________	________

DECONTAMINATION METHOD: Steam cleaned pump, bailer PVC flow valve

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM

FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	● 10 GAL	● 40 GAL	● 80 GAL	● ___ GAL	● ___ GAL
TEMPERATURE, DEG C	14°	15	15		
pH, units	7.36	7.32	7.18		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1300	1320	1350		

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☑ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: 51AD | JOB NO. 2573.0040 | DATE 4/16/90

SAMPLE LOCATION I.D. CC31MW | LOCATION ACTIVITY START: 8-15 END: 1205

WATER LEVEL / WELL DATA

WELL DEPTH: ?2.88 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND): 2'2" FT

WATER DEPTH: 70.32 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP. USED: ☑ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 13.56 FT × ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 8.86 GAL/VOL

Annulus + Well Vol. 150 Gal. TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☑ ☐
CONCRETE COLLAR INTACT ☑ ☐
OTHER ______ ☐ ☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR: PURGING / SAMPLING — EQUIPMENT I.D.

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD:
Steam clean
4" SS bailer
2" SS bailer

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM — WELL MOUTH ____ PPM — FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 20 GAL	@ 70 GAL	@ 120 GAL	@ 150 GAL	@ ___ GAL
TEMPERATURE, DEG C	14.5	15.5	16°	16°	
pH, units	7.45	7.63	7.66	7.67	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1050	1090	590	590	

SAMPLE OBSERVATIONS: ☐ TURBID ☑ COLORED ☐ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD
JOB NO.: 2573.0040
DATE: 4/16/90
SAMPLE LOCATION I.D.: CCB-02-MWA
LOCATION ACTIVITY: START: 1250 END: 1502

WATER LEVEL / WELL DATA

WELL DEPTH: 105.90 FT
☑ MEASURED ☐ HISTORICAL
☐ TOP OF WELL ☑ TOP OF CASING ☐ ______
CASING STICK-UP (FROM GROUND): 1.1 FT

WATER DEPTH: 86.35 FT
WELL MATERIAL: ☑ PVC ☐ SS ☐ ______
WELL LOCKED? ☑ YES ☐ NO
WELL DIA. ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ______
WATER LEVEL EQUIP USED: ☑ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 19.55 FT
X ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.)
= 12.71 GAL/VOL
TOTAL GAL PURGED: Annulus + Well vol. 200 Gal

WELL INTEGRITY: YES / NO
PROT. CASING SECURE: ☑
CONCRETE COLLAR INTACT: ☑
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR: PURGING / SAMPLING)

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	Grundfos 3 Ld.
☐	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam cleaned bailers, pump, PVC, [illegible] valve

FIELD ANALYSIS DATA

AMBIENT AIR VOA ______ PPM
WELL MOUTH ______ PPM
FIELD DATA COLLECTED: ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	● ___ GAL	● ___ GAL	● ___ GAL	● ___ GAL	● ___ GAL
TEMPERATURE, DEG C					
pH, units					
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)					

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☐ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER: [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT	SIAD	JOB NO. 2573.0040	DATE 4/19/90
SAMPLE LOCATION I.D.	DRM03MW	LOCATION ACTIVITY	START: 1430 END: 1623

WATER LEVEL / WELL DATA

WELL DEPTH: 110.07 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND): 1'4" FT

WATER DEPTH: 96.11 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP. USED: ☑ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 13.96 FT × ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 9.12 GAL/VOL

TOTAL GAL PURGED: well vol. [illegible] [illegible] 155

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☑	☐
CONCRETE COLLAR INTACT	☑	☐
OTHER ______	☐	☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	Grundfos 3 Horse
☐	☑	BAILER	2" + 4" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: steam clean bailors, PVC pump, flow value

FIELD ANALYSIS DATA

AMBIENT AIR VOA ______ PPM — WELL MOUTH ______ PPM — FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 10 GAL	@ 30 GAL	@ 40 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C	17°	17°	16°		
pH, units	7.41	7.46	7.25		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1100	1100	1050		

SAMPLE OBSERVATIONS: ☐ TURBID ☑ COLORED ☐ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SAID | JOB NO. 2573.0040 | DATE 4/10/90

SAMPLE LOCATION I.D. DM04MW | LOCATION ACTIVITY START: 1140 END: 1315

WATER LEVEL / WELL DATA

WELL DEPTH 110.00 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ____ — CASING STICK-UP (FROM GROUND) 1.5" FT

WATER DEPTH 96.32 FT — WELL MATERIAL: ☑ PVC ☐ SS ☐ ____ — WELL LOCKED? ☑ YES ☐ NO — WELL DIA. ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ____ — WATER LEVEL EQUIP. USED: ☑ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ____

HEIGHT OF WATER COLUMN 13.68 FT × ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 8.93 GAL/VOL

TOTAL GAL PURGED: [illegible] 152

WELL INTEGRITY: YES NO
PROTECTIVE CASING SECURE ☑ ☐
CONCRETE COLLAR INTACT ☑ ☐
OTHER ____ ☐ ☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR: PURGING / SAMPLING)

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	Grundfos 5 hrs.
☐	☑	BAILER	2" + 4" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam cleaned bailers, PVC pump, flow value

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM — WELL MOUTH ____ PPM — FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 10 GAL	@ 75 GAL	@ 140 GAL	@ 160 GAL	@ ___ GAL
TEMPERATURE, DEG C	16.5	16.5	17	16	
pH, units	7.41	7.16	7.21	7.14	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	750	800	820	800	

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☑ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT SIAD JOB NO. 2573.0040 DATE 6/19/90

SAMPLE LOCATION I.D. DMO5MW LOCATION ACTIVITY START: 835 END: 1120

WATER LEVEL / WELL DATA

WELL DEPTH 109.98 FT ☑ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ CASING STICK-UP (FROM GROUND) 1'10" FT

WATER DEPTH 95.28 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP. USED: ☑ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 14.70 FT X ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 9.60 GAL/VOL

well vol and gallons = 163 TOTAL GAL PURGED *

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☑ ☐
CONCRETE COLLAR INTACT ☑ ☐
OTHER ______ ☐ ☐

* well dewatered, 30 gals purged

EQUIPMENT DOCUMENTATION

DECONTAMINATION METHOD: Steam cleaned bailers, pump, flow valve PVC

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	Grundfos 3 hrs.
☐	☑	BAILER	2" x 4' SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	● 10 GAL	● 30 GAL	● 35 GAL	● ___ GAL	● ___ GAL
TEMPERATURE, DEG C	15	15	16°		
pH, units	7.37	7.45	7.63		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	1050	950		

SAMPLE OBSERVATIONS
☐ TURBID
☑ COLORED
☑ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	/
☐				☐	/
☐				☐	/
☐				☐	/
☐				☐	/
☐				☐	/
☐				☐	/
☐				☐	/

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery

Consulting Engineers, Inc.

PROJECT: SIAD | JOB NO. 2573.0040 | DATE 4/24/90

SAMPLE LOCATION I.D. DSB 4 MW | LOCATION ACTIVITY START: 1430 END: 530

WATER LEVEL / WELL DATA

WELL DEPTH: 41.70 FT

☒ MEASURED ☐ HISTORICAL

☐ TOP OF WELL ☒ TOP OF CASING ☐ ______

CASING STICK-UP (FROM GROUND): 2.0 FT

WATER DEPTH: 24.65 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ______

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☒ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP. USED: ☒ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 17.05 FT X ☒ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 2.73 GAL/VOL

[illegible] well vol. 47 TOTAL GAL PURGED

WELL INTEGRITY	YES	NO
PROT. CASING SECURE	☒	☐
CONCRETE COLLAR INTACT	☐	☐
OTHER ______	☐	☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☒	☒	BAILER	2" B
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Steam clean bailer with flow valve.

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM | WELL MOUTH ____ PPM

FIELD DATA COLLECTED: ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ ___ GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units					
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)					

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☐ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES.

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT SIAD JOB NO. 2573.0240 DATE 4/20/90

SAMPLE LOCATION I.D. TNTIMWA LOCATION ACTIVITY START: 1445 END: 1625

WATER LEVEL / WELL DATA

WELL DEPTH 78.60 FT ☑ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ CASING STICK-UP (FROM GROUND) 2'6" FT

WATER DEPTH 58.02 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP. USED: ☑ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 20.58 FT x ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 3.29 GAL/VOL

Well vol and Casing = 57 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☑ ☐
CONCRETE COLLAR INTACT ☑ ☐
OTHER ______ ☐ ☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Steam cleaned bailer, flow valve

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM

FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 5 GAL	@ 20 GAL	@ 50 GAL	@ 55 GAL	@ ___ GAL
TEMPERATURE, DEG C	16°	15	15	15	
pH, units	* N/A	N/A	N/A	N/A	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	850	850	850	850	

SAMPLE OBSERVATIONS
☐ TURBID
☑ COLORED
☑ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES: Duplicate taken
* N/A = Not available

SIGNATURE OF SAMPLER JG Hill

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT	SIAD	JOB NO. 0573.0040	DATE 4/20/90
SAMPLE LOCATION I.D.	TNTIMWB	LOCATION ACTIVITY	START: 1230 END: 1422

WATER LEVEL / WELL DATA

WELL DEPTH: 102.98 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND): 3'1" FT

WATER DEPTH: 58.23 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP USED: ☑ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 44.75 FT × ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 29.09 GAL/VOL

TOTAL GAL PURGED: well [illegible] gallons: 262

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☑	☐
CONCRETE COLLAR INTACT	☑	☐
OTHER ______	☐	☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	~~Grundfos~~ 3 hrs
☐	☑	BAILER	2" + 4" bailor
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	______
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	______

DECONTAMINATION METHOD: Steam clean bailors PVC Pump, Clean valve

FIELD ANALYSIS DATA

AMBIENT AIR VOA ______ PPM [redacted] WELL MOUTH ______ PPM

FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 10 GAL	@ 70 GAL	@ 180 GAL	@ 270 GAL	@ 280 GAL
TEMPERATURE, DEG C	19.5	17	17.5	17	17
pH, units	7.54	7.74	* N/A	N/A	N/A
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1200	1100	1120	1120	1120

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☑ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /

NOTES:
* - N/A = Not available

SIGNATURE OF SAMPLER: [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD | JOB NO. 2573 | DATE 4/20/90

SAMPLE LOCATION I.D.: TNT1MWC | LOCATION ACTIVITY START: 830 END: 1145

WATER LEVEL / WELL DATA

WELL DEPTH: 140.17 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND): 2' 1" FT

WATER DEPTH: 58.13 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP. USED: ☑ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 80.06 FT × ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 53.34 GAL/VOL

well vol ... Analysis 390 TOTAL GAL PURGED

WELL INTEGRITY: YES / NO
PROT. [redacted] SECURE ☑ ☐
[redacted] LLAR INTACT ☑ ☐
OTHER ______ ☐ ☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR: PURGING / SAMPLING)

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	3 horse Grundfos
☐	☑	BAILER	2" + 4" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: steam cleaned bailors, PVC, Pump, flow value

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM   WELL MOUTH ____ PPM   FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 10 GAL	@ 100 GAL	@ 210 GAL	@ 300 GAL	@ ___ GAL
TEMPERATURE, DEG C	15	14	16	16	
pH, units	7.60	7.55	7.50	7.60	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	980	850	850	1000	

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☑ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD | JOB NO.: 2573.0010 | DATE: 6/21/90

SAMPLE LOCATION I.D.: TNT2MGIA | LOCATION ACTIVITY START: 1415 END: 1540

WATER LEVEL / WELL DATA

WELL DEPTH: 75.74 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______

CASING STICK-UP (FROM GROUND): 1'9" FT

WATER DEPTH: 56.49 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA.: ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP USED: ☑ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 19.25 FT × ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 3.08 GAL/VOL

TOTAL GAL PURGED: well vol + annulus: 55

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☑ ☐
CONCRETE COLLAR INTACT ☑ ☐
OTHER ______ ☐ ☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR: PURGING / SAMPLING

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	2" × 4' 5.0' S.S.
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Steam cleaned bailers + flow valve

FIELD ANALYSIS DATA

AMBIENT AIR VOA [redacted] ___ PPM | WELL MOUTH ___ PPM | FIELD DATA COLLECTED: ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 5 GAL	@ 20 GAL	@ 50 GAL	@ 55 GAL	@ ___ GAL
TEMPERATURE, DEG C	13.5	14	14	13.5	
pH, units	* N/A	N/A	N/A	N/A	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1300	1290	1300	1290	

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☑ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:
* - N/A: not available

SIGNATURE OF SAMPLER: [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT SIAD JOB NO. 3575 0040 DATE 4/21/90

SAMPLE LOCATION I.D. TNT2MWB LOCATION ACTIVITY START: 1130 END: 1335

WATER LEVEL / WELL DATA

WELL DEPTH 101.03 FT ☑ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ CASING STICK-UP (FROM GROUND) 1'10" FT

WATER DEPTH 56.44 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP. USED: ☑ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 44.59 FT x ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 28.98 GAL/VOL

[illegible] TOTAL GAL PURGED

WELL INTEGRITY: YES / NO
PROT. CASING SECURE ☑ ☐
CONCRETE COLLAR INTACT ☑ ☐
OTHER ______ ☐ ☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	[illegible] 3 hose
☐	☑	BAILER	2" + 4" bailer
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: steam cleaned PVC, flow value, pump, bailors

FIELD ANALYSIS DATA

AMBIENT AIR VOA ______ PPM WELL MOUTH ______ PPM FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	● 10 GAL	● 130 GAL	● 260 GAL	● ___ GAL	● ___ GAL
TEMPERATURE, DEG C	14°	14°	14°		
pH, units	* N/A	N/A	N/A		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1030	1090	1060		

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☑ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:
* N/A = Not available

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT	SIAD	JOB NO.	2573.0040	DATE	4-21-90
SAMPLE LOCATION I.D.	TNT2MWC	LOCATION ACTIVITY	START: 930	END: 1040	

WATER LEVEL / WELL DATA

WELL DEPTH: 142.07 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______

CASING STICK-UP (FROM GROUND): 2'11" FT

WATER DEPTH: 56.98 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP. USED: ☑ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 85.09 FT × ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 55.30 GAL/VOL

TOTAL GAL PURGED: well vol 7 and/less 394

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☑	☐
CONCRETE COLLAR INTACT	☑	☐
OTHER ______	☐	☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

PURGING	SAMPLING	✓ IF USED FOR:	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	Grundfos 3hrs
☐	☑	BAILER	2" & 4" bailer
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Steam clean bailors pump, PVC, flow value

FIELD ANALYSIS DATA

AMBIENT AIR VOA ______ PPM WELL MOUTH ______ PPM

FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	● 10 GAL	● 130 GAL	● 680 GAL	● 396 GAL	● 402 GAL
TEMPERATURE, DEG C	14.6	14°	14.5	15	14
pH, units	* N/A	N/A	N/A	N/A	N/A
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	900	890	870	890	790

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☑ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /

NOTES:

* N/A = Not available

SIGNATURE OF SAMPLER: [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PAGE 1 OF 1

PROJECT SIAD JOB NO. 2573.0040 DATE 5/1/90

SAMPLE LOCATION I.D. TNT 3 MWA LOCATION ACTIVITY START: 1045 END: 1240

WATER LEVEL / WELL DATA

WELL DEPTH 67.82 FT ☑ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☑ TOP OF CASING ☐ CASING STICK-UP (FROM GROUND) 3.2 FT

WATER DEPTH 55.93 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐

WATER LEVEL EQUIP USED: ☑ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐

HEIGHT OF WATER COLUMN 11.89 FT × ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.88 GAL/VOL

4 [illegible] well vol: 33 gal. TOTAL GAL PURGED

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☑	
CONCRETE COLLAR INTACT	☑	
OTHER		

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Triple rinsed bailers and flow valve w DI water

FIELD ANALYSIS DATA

AMBIENT AIR VOA ___ PPM WELL MOUTH ___ PPM FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ ___ GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units					
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)					

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☐ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES.

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PAGE ____ OF ____

PROJECT 51-1 | JOB NO. [illegible] | DATE 5 [illegible]

SAMPLE LOCATION I.D. [illegible] | LOCATION ACTIVITY START: 3:0 END: [illegible]

WATER LEVEL / WELL DATA

WELL DEPTH 28.76 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND) [illegible] FT

WATER DEPTH 56.22 FT — WELL MATERIAL: ☑ PVC ☐ SS ☐ ______ — WELL LOCKED? ☑ YES ☐ NO — WELL DIA. ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ______ — WATER LEVEL EQUIP. USED: ☑ ELECT.COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN [illegible] FT × ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 2.04 GAL/VOL

[illegible] TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE
CONCRETE COLLAR INTACT
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR:

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	[illegible]
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: [illegible]

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 5 GAL	@ 5 GAL	@ 35 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C	[illegible]	3	[illegible]		
pH, units	[illegible]	[illegible]	[illegible]		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1090	1030	[illegible]		

SAMPLE OBSERVATIONS
☐ TURBID
☑ COLORED
☐ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT	SIAD	JOB NO. 2573 0040	DATE 5/2/90
SAMPLE LOCATION I.D.	TNT5MW	LOCATION ACTIVITY	START: 1525 END: 1720

WATER LEVEL / WELL DATA

WELL DEPTH 68.84 FT ☑ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ CASING STICK-UP (FROM GROUND) 2.2 FT

WATER DEPTH 60.48 FT WELL MATERIAL: ☑ PVC ☐ SS ☐ ______ WELL LOCKED? ☑ YES ☐ NO WELL DIA. ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ______ WATER LEVEL EQUIP USED ☑ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 8.36 FT x ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.36 GAL/VOL

TOTAL GAL PURGED: [illegible] 25

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☑
CONCRETE COLLAR INTACT ☑
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR: PURGING SAMPLING)

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam cleaned bailers are flow valve

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 1 GAL	@ 20 GAL	@ 25 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C	17	16.5	16		
pH, units	7.75	7.58	7.67		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	800	880	880		

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☑ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES.

SIGNATURE OF SAMPLER [signature]

James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD   JOB NO. 3573.0040   DATE: 5/8/90

SAMPLE LOCATION I.D.: TNT6MW   LOCATION ACTIVITY START: 1410 END: 1530

WATER LEVEL / WELL DATA

WELL DEPTH: 68.56 FT ☑ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☑ TOP OF CASING ☐ ____ CASING STICK-UP (FROM GROUND): 2'9" FT

WATER DEPTH: 57.50 FT WELL MATERIAL: ☑ PVC ☐ SS ☐ ____ WELL LOCKED? ☑ YES ☐ NO WELL DIA. ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ____ WATER LEVEL EQUIP. USED: ☑ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ____

HEIGHT OF WATER COLUMN: 10.96 FT X ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.79 GAL/VOL | well vol analysis 3) TOTAL GAL PURGED

WELL INTEGRITY: YES / NO
PROT. CASING SECURE: ☑
CONCRETE COLLAR INTACT: ☑
OTHER ____

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR: PURGING / SAMPLING

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam cleaned bailers ✓ ... [illegible]

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 1 GAL	@ 30 GAL	@ 35 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C	10	* N/A	N/A		
pH, units	7.55	7.40	7.24		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1700	1600	1500		

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☑ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:
* N/A = not available

SIGNATURE OF SAMPLER: [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: 51AD | JOB NO.: 2573.0040 | DATE: 4/18/90

SAMPLE LOCATION I.D.: TNT7MWA | LOCATION ACTIVITY: START: 1230 END: 1405

WATER LEVEL / WELL DATA

WELL DEPTH: 58.71 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND): 1.0' FT

WATER DEPTH: 57.24 FT — WELL MATERIAL: ☑ PVC ☐ SS ☐ ______ — WELL LOCKED? ☑ YES ☐ NO — WELL DIA.: ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ______ — WATER LEVEL EQUIP. USED: ☑ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 11.47 FT × ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.84 GAL/VOL

Analysis and well vol: 35 TOTAL GAL PURGED

WELL INTEGRITY: YES / NO
PROT. CASING SECURE ☑
CONCRETE COLLAR INTACT ☑
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR: PURGING / SAMPLING)

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Decon bailer
Clean valve

FIELD ANALYSIS DATA

AMBIENT AIR VOA: ____ PPM — WELL MOUTH: ____ PPM — FIELD DATA COLLECTED: ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	1 GAL	8 GAL	20 GAL	35 GAL	40 GAL
TEMPERATURE, DEG C	15°	15	15	16	15.5
pH, units	7.85	7.82	7.89	7.84	7.87
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	920	950	1000	1000	950

SAMPLE OBSERVATIONS: ☐ TURBID ☑ COLORED ☐ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES.

SIGNATURE OF SAMPLER: [signature]

James M. Montgomery
Consulting Engineers, Inc.

PROJECT SIAD JOB NO. 2573.0040 DATE 4/18/90

SAMPLE LOCATION I.D. TNT-07-MWB LOCATION ACTIVITY START: 9:00 END: 11:35

WATER LEVEL / WELL DATA

WELL DEPTH 103.57 FT
☑ MEASURED ☐ HISTORICAL
☐ TOP OF WELL ☑ TOP OF CASING ☐ ______
CASING STICK-UP (FROM GROUND) 2'5" FT

WATER DEPTH 58.40 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______
WELL LOCKED? ☑ YES ☐ NO
WELL DIA. ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ______
WATER LEVEL EQUIP. USED: ☑ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 46.17 FT X ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 30.5 GAL/VOL

annulus and well vol: 512 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ✓
CONCRETE COLLAR INTACT ✓
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	Grundfos 3 horse
☐	☑	BAILER	6' SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam cleaned bailer, pump PVC flow valve

FIELD ANALYSIS DATA

AMBIENT AIR VOA ___ PPM WELL MOUTH ___ PPM FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 10 GAL	@ 100 GAL	@ 200 GAL	@ 290 GAL	@ ___ GAL
TEMPERATURE, DEG C	14.3°	15°	14.5°	15°	
pH, units	7.63	7.71	7.60	7.68	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1100	1110	1100	1050	

SAMPLE OBSERVATIONS
☐ TURBID
☑ COLORED
☐ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES.

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PAGE 1 OF 1

PROJECT SIAO | JOB NO. 2573-0040 | DATE 4-18-90

SAMPLE LOCATION I.D. TNT [illegible] MWC | LOCATION ACTIVITY START: 1430 END: 1710

WATER LEVEL / WELL DATA

WELL DEPTH 141.76 FT
☑ MEASURED ☐ HISTORICAL
☐ TOP OF WELL ☑ TOP OF CASING ☐ ______
CASING STICK-UP (FROM GROUND) 2'10" FT

WATER DEPTH 58.95 FT
WELL MATERIAL: ☑ PVC ☐ SS ☐ ______
WELL LOCKED? ☑ YES ☐ NO
WELL DIA. ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ______
WATER LEVEL EQUIP. USED: ☑ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 82.81 FT
X ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.)
= 54.07 GAL/VOL
[illegible] 299 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☒
CONCRETE COLLAR INTACT ☒
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	Grundfos 3"
☐	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD:
Steam Clean
Pump
Bailer
PVC
Flow Value

FIELD ANALYSIS DATA

AMBIENT AIR VOA ______ PPM | WELL MOUTH ______ PPM | FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	● 10 GAL	● 100 GAL	● 200 GAL	● 290 GAL	● ___ GAL
TEMPERATURE, DEG C	17	16.5	19	19	
pH, units	~~[illegible]~~ 7.79	7.52	7.60	7.60	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1080	1000	1000	1090	

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☑ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /
☐				☐	/ /

NOTES:

SIGNATURE OF SAMPLER [signature]

James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD JOB NO. 2573.0040 DATE 5/3/90

SAMPLE LOCATION I.D. TN-8MWA LOCATION ACTIVITY START: 1315 END: 1545

WATER LEVEL / WELL DATA

WELL DEPTH 58.65 FT ☑ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ CASING STICK-UP (FROM GROUND) 3'6" FT

WATER DEPTH 58.87 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP USED: ☑ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 9.78 FT × ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.59 GAL/VOL

well vol. equals 27 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☑
CONCRETE COLLAR INTACT ☑
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR: PURGING SAMPLING

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Steam cleaned bailers & flow valve

FIELD ANALYSIS DATA

AMBIENT AIR VOA ______ PPM WELL MOUTH ______ PPM

FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 1 GAL	@ 5 GAL	@ 10 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C	16°	16	16		
pH, units	7.86	7.86	7.73		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	900	980	900		

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☑ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES: Well dewatered

SIGNATURE OF SAMPLER

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD | JOB NO. 2573 2040 | DATE 5/3/90

SAMPLE LOCATION I.D. TNT9MWA | LOCATION ACTIVITY START: 845 END: 1020

WATER LEVEL / WELL DATA

WELL DEPTH: 66.91 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______

CASING STICK-UP (FROM GROUND): 2'5" FT

WATER DEPTH: 57.48 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP USED: ☑ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 9.43 FT × ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.53 GAL/VOL

Well vol. ~ 1 [illegible] TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☑
CONCRETE COLLAR INTACT ☑
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR:)

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Steam cleaned bailers, flow valve

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM | WELL MOUTH ____ PPM | FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 1 GAL	@ 5 GAL	@ 16 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C	15°	15°	14.5		
pH, units	7.42	7.53	7.81		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	830	720	850		

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☑ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES: Well dewatered

SIGNATURE OF SAMPLER: [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: 5140 | JOB NO. 2573.0040 | DATE 4/30/90

SAMPLE LOCATION I.D.: TNT 10 MW4 | LOCATION ACTIVITY START: 1350 END: 1500

WATER LEVEL / WELL DATA

WELL DEPTH: 68.81 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND): 3.5 FT

WATER DEPTH: 59.64 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP. USED: ☑ ELECT COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 9.17 FT × ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.47 GAL/VOL

TOTAL GAL PURGED: Drained well vol.=26 gals

WELL INTEGRITY: YES / NO
- PROT. CASING SECURE: ☑ YES
- CONCRETE COLLAR INTACT: ☑ YES
- OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR: PURGING, SAMPLING)

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Steam clean bailers, flow valve

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM — WELL MOUTH ____ PPM — FIELD DATA COLLECTED: ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ ___ GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units					
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)					

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☐ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES.

SIGNATURE OF SAMPLER: Gil Hall

James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD JOB NO. 2573.0040 DATE: 4/30/90

SAMPLE LOCATION I.D.: TNT 10 MWB LOCATION ACTIVITY START: 1130 END: 1340

WATER LEVEL / WELL DATA

WELL DEPTH: 101.97 FT ☑ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ CASING STICK-UP (FROM GROUND): 2.3 FT

WATER DEPTH: 58.95 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP. USED: ☑ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 43.02 FT x ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 28.09 GAL/VOL

TOTAL GAL PURGED: ~~Sampling~~ 1 Well vol.: 25Y gal

WELL INTEGRITY: YES / NO
PROT. CASING SECURE ☑ YES
CONCRETE COLLAR INTACT ☑ YES
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR: PURGING / SAMPLING

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	grundfos 3 hrs
☐	☑	BAILER	2" SS 4' SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: steam cleaned pump, bailers, flow valve, PVC

FIELD ANALYSIS DATA

AMBIENT AIR VOA ___ PPM WELL MOUTH ___ PPM FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ ___ GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units					
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)					

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☐ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	/
☐				☐	/
☐				☐	/
☐				☐	/
☐				☐	/
☐				☐	/
☐				☐	/

NOTES: EC Meter not working

SIGNATURE OF SAMPLER: J. Hill

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD | JOB NO.: 25730040 | DATE: 4/30/90

SAMPLE LOCATION I.D.: TNT 10 MWC | LOCATION ACTIVITY START: 8:00 END: 1055

WATER LEVEL / WELL DATA

WELL DEPTH: 138.10 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ____ — CASING STICK-UP (FROM GROUND): 2.4 FT

WATER DEPTH: 58.93 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ____

WELL LOCKED? ☑ YES ☐ NO

WELL DIA.: ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ____

WATER LEVEL EQUIP. USED: ☑ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ____

HEIGHT OF WATER COLUMN: 79.17 FT × ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 51.46 GAL/VOL

TOTAL GAL PURGED: Grundfos well vol = 377 gals

WELL INTEGRITY: YES / NO
PROT. CASING SECURE: ☑
CONCRETE COLLAR INTACT: ☑
OTHER ____

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR: PURGING / SAMPLING)

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	Grundfos 3 Hrs.
☐	☑	BAILER	Jbailer 3" × 4' SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	____	

DECONTAMINATION METHOD: Steam clean bailers pump flow valve, PVC

FIELD ANALYSIS DATA

AMBIENT AIR VOA: ____ PPM | WELL MOUTH: ____ PPM | FIELD DATA COLLECTED: ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ ___ GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units					
SPECIFIC CONDUCTIVITY (umhos/cm @ 25 deg.c)					

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☒ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

✓ IF REQUIRED AT THIS LOCATION

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER: J. Hill

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD — JOB NO. 2573.0040 — DATE 5/3/90

SAMPLE LOCATION I.D.: TNT 11 MWR — LOCATION ACTIVITY START: 1040 END: 1245

WATER LEVEL / WELL DATA

WELL DEPTH: 74.28 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND): 1'8" FT

WATER DEPTH: 60.91 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP USED: ☑ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 13.37 FT × ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 2.18 GAL/VOL

well vol... TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE
CONCRETE COLLAR INTACT
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR:

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Steam cleaned bailers & new valve

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM — WELL MOUTH ____ PPM — FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 5 GAL	@ 10 GAL	@ 15 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C	16	15	17		
pH, units	7.81	7.79	7.72		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	2150	2500	2420		

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☑ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

✓ IF REQUIRED AT THIS LOCATION

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER: [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD
JOB NO.: 2573.0040
DATE: 4/25/90
SAMPLE LOCATION I.D.: TNT 12 MWA
LOCATION ACTIVITY: START: 800 END: 1020

WATER LEVEL / WELL DATA

WELL DEPTH: 60.22 FT
☑ MEASURED ☐ HISTORICAL
☐ TOP OF WELL ☑ TOP OF CASING ☐
CASING STICK-UP (FROM GROUND): 2.2 FT

WATER DEPTH: 52.59 FT
WELL MATERIAL: ☑ PVC ☐ SS ☐
WELL LOCKED? ☑ YES ☐ NO
WELL DIA. ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐
WATER LEVEL EQUIP USED: ☑ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐

HEIGHT OF WATER COLUMN: 7.63 FT
X ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.)
= 1.22 GAL/VOL
TOTAL GAL PURGED: [illegible] well vol. ~ 21 gal

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☑
CONCRETE COLLAR INTACT ☑
OTHER

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam cleaned bailers [illegible]

FIELD ANALYSIS DATA

AMBIENT AIR VOA ___ PPM
WELL MOUTH ___ PPM
FIELD DATA COLLECTED: ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ ___ GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units					
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)					

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☐ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES.

SIGNATURE OF SAMPLER: [signature]

James M. Montgomery
Consulting Engineers, Inc.

PROJECT SIAD JOB NO. 2573.0040 DATE 5/1/90
SAMPLE LOCATION I.D. TNT 13 MWA LOCATION ACTIVITY START: 830 END: 950

WATER LEVEL / WELL DATA

WELL DEPTH 69.24 FT ☑ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☑ TOP OF CASING ☐ CASING STICK-UP (FROM GROUND) FT

WATER DEPTH 58.42 FT WELL MATERIAL: ☑ PVC ☐ SS ☐ WELL LOCKED? ☑ YES ☐ NO WELL DIA. ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ WATER LEVEL EQUIP USED: ☑ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐

HEIGHT OF WATER COLUMN 10.82 FT X ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.73 GAL/VOL

TOTAL GAL PURGED: ~~[illegible]~~ Well vol: 30 gal.

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☑	☐
CONCRETE COLLAR INTACT	☑	☐
OTHER ______	☐	☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	2" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Triple rinsed bailer and flow valve with DI water

FIELD ANALYSIS DATA

AMBIENT AIR VOA ___ PPM WELL MOUTH ___ PPM FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ ___ GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units					
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)					

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☐ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

PROJECT: SIAD | JOB NO. 0573.0040 | DATE 4/24/90

SAMPLE LOCATION I.D. TNT14MW2 | LOCATION ACTIVITY START: 935 END: 1150

WATER LEVEL / WELL DATA

1115

WELL DEPTH 65.12 FT ☑ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______

CASING STICK-UP (FROM GROUND) 1' FT

WATER DEPTH 50.43 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP. USED: ☑ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 4.69 FT × ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 2.39 GAL/VOL

[illegible] TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☑ ☐
CONCRETE COLLAR INTACT ☑ ☐
OTHER ______ ☐ ☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR: PURGING / SAMPLING

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	2" + 4" SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Triple rinsed bailors + flow valve with DI water

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 5 GAL	@ 10 GAL	@ 10 GAL	@ 6.5 GAL	@ ___ GAL
TEMPERATURE, DEG C	3.5	3.5	14	[illegible]	
pH, units	~7	[illegible]	~7	~7	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1100	1080	1100	1100	

SAMPLE OBSERVATIONS ☐ TURBID ☑ COLORED ☐ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT	51AD	JOB NO. 2573.0040	DATE 5/2/90
SAMPLE LOCATION I.D.	TN75MW	LOCATION ACTIVITY	START: 8:20 END: 1035

WATER LEVEL / WELL DATA

WELL DEPTH: 71.25 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ____ — CASING STICK-UP (FROM GROUND): 2.4 FT

WATER DEPTH: 54.45 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ____

WELL LOCKED? ☑ YES ☐ NO

WELL DIA.: ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ____

WATER LEVEL EQUIP USED: ☑ ELECT.COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ____

HEIGHT OF WATER COLUMN: 16.80 FT × ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 10.97 GAL/VOL

TOTAL GAL PURGED: We. vol. casing 187

WELL INTEGRITY:

	YES	NO
PROT. CASING SECURE	☑	☐
CONCRETE COLLAR INTACT	☑	☐
OTHER ____	☐	☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	2" ... SS
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	____	

DECONTAMINATION METHOD: Steam cleaned before, flow valve.

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM

FIELD DATA COLLECTED: ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 5 GAL	@ 30 GAL	@ 40 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C	16°	16	16		
pH, units	7.45	7.36	7.31		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1420	1450	1576		

SAMPLE OBSERVATIONS: ☐ TURBID ☑ COLORED ☐ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES: Water was very silty

SIGNATURE OF SAMPLER: [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD | JOB NO. 2573.0040 | DATE 5/3/90

SAMPLE LOCATION I.D. TNT16MW | LOCATION ACTIVITY START: 1125 END: 1335

WATER LEVEL / WELL DATA

WELL DEPTH 71.88 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND) 1'10" FT

WATER DEPTH 58.56 FT

WELL MATERIAL: ☑ PVC ☐ SS ☐ ______

WELL LOCKED? ☑ YES ☐ NO

WELL DIA. ☐ 2 INCH ☑ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP. USED: ☑ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 13.32 FT X ☐ .16 GAL/FT (2 IN.) ☑ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 8.70 GAL/VOL

well vol ~ 18 vols = 148 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☑
CONCRETE COLLAR INTACT ☑
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR: PURGING / SAMPLING)

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	Grundfos 3 ers
☐	☑	BAILER	2" x 4' teflon
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	______

DECONTAMINATION METHOD: Steam cleaned bailers, PVC, Pump, flow valve

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM | WELL MOUTH ____ PPM

FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 5 GAL	@ 60 GAL	@ 110 GAL	@ 160 GAL	@ ___ GAL
TEMPERATURE, DEG C	16.3	17	18	16	
pH, units	7.48	7.12	7.21	7.34	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	790	820	820	820	

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☑ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD PHASE I RI/FS JOB NO. 2573OO41 DATE 5/31/90
SAMPLE LOCATION I.D. ALF-Ø1-MWA LOCATION ACTIVITY START: 1640 END: 1740

WATER LEVEL / WELL DATA

WELL DEPTH 105.07 FT — ☒ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☒ TOP OF CASING ☐ ____ — CASING STICK-UP (FROM GROUND) 0.9 FT

WATER DEPTH 91.83 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ____

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☐ 2 INCH ☒ 4 INCH ☐ 6 INCH ☐ ____

WATER LEVEL EQUIP USED: ☒ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ____

HEIGHT OF WATER COLUMN 13.24 FT × ☐ .16 GAL/FT (2 IN.) ☒ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 8.61 GAL/VOL

160 TOTAL GAL PURGED

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☒	
CONCRETE COLLAR INTACT	☒	
OTHER ____		

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☒	☐	SUBMERSIBLE PUMP	
☐	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	____	

DECONTAMINATION METHOD: STEAM CLEAN Bailer Pump Hoses

FIELD ANALYSIS DATA

AMBIENT AIR VOA NA PPM WELL MOUTH ____ PPM FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 10 GAL	@ 50 GAL	@ 100 GAL	@ 150 GAL	@ ____ GAL
TEMPERATURE, DEG C	–	–	–	–	–
pH, units	7.1	7.0	7.0	7.0	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	1000	1000	1000	

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☒ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD PHASE 1 RI/FS — JOB NO. 2573.0041 — DATE 6/1/90

SAMPLE LOCATION I.D. ALF-Ø2-MWA — LOCATION ACTIVITY START: 0745 END: 0900

WATER LEVEL / WELL DATA

WELL DEPTH 79.22 FT — [x] MEASURED [ ] HISTORICAL — ~~TOP OF WELL~~ Gb [x] TOP OF CASING [ ] ____ — CASING STICK-UP (FROM GROUND) 1.8 FT

WATER DEPTH 57.98 FT

WELL MATERIAL: [x] PVC [ ] SS [ ] ____

WELL LOCKED? [x] YES [ ] NO

WELL DIA. [ ] 2 INCH [x] 4 INCH [ ] 6 INCH [ ] ____

WATER LEVEL EQUIP USED: [x] ELECT COND PROBE [ ] FLOAT ACTIVATED [ ] PRESS. TRANSDUCER [ ] ____

HEIGHT OF WATER COLUMN 21.24 FT × [ ] .16 GAL/FT (2 IN.) [x] .65 GAL/FT (4 IN.) [ ] 1.5 GAL/FT (6 IN.) [ ] ___ GAL/FT (___ IN.) = 13.81 GAL/VOL

250 TOTAL GAL PURGED

WELL INTEGRITY: YES / NO
PROT. CASING SECURE: [x] YES
CONCRETE COLLAR INTACT: [x] YES
OTHER ____

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR:

PURGING	SAMPLING		EQUIPMENT I.D.
[ ]	[ ]	PERISTALTIC PUMP	
[x]	[ ]	SUBMERSIBLE PUMP	
[ ]	[x]	BAILER	
[ ]	[ ]	PVC/SILICON TUBING	
[ ]	[ ]	TEFLON/SILICON TUBING	
[ ]	[ ]	AIR LIFT	
[ ]	[ ]	HAND PUMP	
	[ ]	IN-LINE FILTER	
	[ ]	PRESS/VAC FILTER	
[ ]	[ ]	____	

DECONTAMINATION METHOD: Steam Clean Bailer Pump Hoses

FIELD ANALYSIS DATA

AMBIENT AIR VOA N/D PPM — WELL MOUTH N/D PPM — FIELD DATA COLLECTED [ ] IN-LINE [x] IN CONTAINER

PURGE DATA	@ 50 GAL	@ 100 GAL	@ 150 GAL	@ 200 GAL	@ 250 GAL
TEMPERATURE, DEG C					
pH, units	6.0	6.6	6.6	6.6	6.6
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	1000	1000	1000	1000

SAMPLE OBSERVATIONS: [ ] TURBID [ ] COLORED [x] CLOUDY [ ] CLEAR [ ] ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	

NOTES.

SIGNATURE OF SAMPLER: C L Hill

James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD PHASE I RI/FS
JOB NO. 2573.0041
DATE: 6/1/90
SAMPLE LOCATION I.D.: ALF-03-MWA
LOCATION ACTIVITY: START 0900 END: 1055

WATER LEVEL / WELL DATA

WELL DEPTH: 107.65 FT
- [x] MEASURED
- [ ] HISTORICAL
- [ ] TOP OF WELL
- [x] TOP OF CASING
- [ ] ______

CASING STICK-UP (FROM GROUND): 2.0 FT

WATER DEPTH: 95.83 FT

WELL MATERIAL:
- [x] PVC
- [ ] SS
- [ ] ______

WELL LOCKED?
- [x] YES
- [ ] NO

WELL DIA.
- [ ] 2 INCH
- [x] 4 INCH
- [ ] 6 INCH
- [ ] ______

WATER LEVEL EQUIP USED:
- [x] ELECT.COND PROBE
- [ ] FLOAT ACTIVATED
- [ ] PRESS. TRANSDUCER
- [ ] ______

HEIGHT OF WATER COLUMN: 11.82 FT ×
- [ ] .16 GAL/FT (2 IN.)
- [x] .65 GAL/FT (4 IN.)
- [ ] 1.5 GAL/FT (6 IN.)
- [ ] ___ GAL/FT (___ IN.)

= 7.68 GAL/VOL
150 TOTAL GAL PURGED

WELL INTEGRITY	YES	NO
PROT. CASING SECURE	X	
CONCRETE COLLAR INTACT	X	
OTHER ______		

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
[ ]	[ ]	PERISTALTIC PUMP	
[x]	[ ]	SUBMERSIBLE PUMP	
[ ]	[x]	BAILER	
[ ]	[ ]	PVC/SILICON TUBING	
[ ]	[ ]	TEFLON/SILICON TUBING	
[ ]	[ ]	AIR LIFT	
[ ]	[ ]	HAND PUMP	
	[ ]	IN-LINE FILTER	
	[ ]	PRESS/VAC FILTER	
[ ]	[ ]	______	

DECONTAMINATION METHOD:
STEAM CLEAN
PUMP
BAILER
HOSES

FIELD ANALYSIS DATA

AMBIENT AIR VOA: — PPM
WELL MOUTH: — PPM

FIELD DATA COLLECTED
- [ ] IN-LINE
- [x] IN CONTAINER

PURGE DATA	@ 10 GAL	@ 25 GAL	@ 50 GAL	@ 100 GAL	@ 150 GAL
TEMPERATURE, DEG C					
pH, units	6.8	6.8	7.0	7.1	7.1
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1600	1500	1400	1200	1200

SAMPLE OBSERVATIONS
- [ ] TURBID
- [ ] COLORED
- [x] CLOUDY
- [ ] CLEAR
- [ ] ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	

NOTES.

SIGNATURE OF SAMPLER: [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PAGE 1 OF 1

PROJECT: SIAD PHASE I RI/FS | JOB NO.: 2573.0041 | DATE: 5/1/90

SAMPLE LOCATION I.D.: CCB-Ø1-MWA | LOCATION ACTIVITY START: 1430 END: 1520

WATER LEVEL / WELL DATA

WELL DEPTH: 92.88 FT
☒ MEASURED ☐ HISTORICAL
☐ TOP OF WELL ☒ TOP OF CASING ☐ ______
CASING STICK-UP (FROM GROUND): 2.2 FT

WATER DEPTH: 79.69 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ______
WELL LOCKED? ☒ YES ☐ NO
WELL DIA.: ☐ 2 INCH ☒ 4 INCH ☐ 6 INCH ☐ ______
WATER LEVEL EQUIP. USED: ☒ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 13.19 FT × ☐ .16 GAL/FT (2 IN.) ☒ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 8.57 GAL/VOL

150 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☒
CONCRETE COLLAR INTACT ☒
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR: PURGING SAMPLING

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☒	☐	SUBMERSIBLE PUMP	
☐	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Steam Clean Pump Bailer Hoses

FIELD ANALYSIS DATA

AMBIENT AIR VOA: – PPM | WELL MOUTH: – PPM | FIELD DATA COLLECTED: ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 10 GAL	@ 50 GAL	@ 100 GAL	@ 150 GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	6.6	6.8	7.0	6.7	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	600	590	590	600	

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☒ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER: [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PAGE 1 OF 1

PROJECT: SIAD PHASE 2 RI/FS
JOB NO.: 2573 [illegible]
DATE: [illegible]

SAMPLE LOCATION I.D.: CCB-[illegible]-MW-7
LOCATION ACTIVITY START: [illegible] END: 0950

WATER LEVEL / WELL DATA

WELL DEPTH: [illegible] FT ☒ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☒ TOP OF CASING ☐ ______
CASING STICK-UP (FROM GROUND): 1.1 FT

WATER DEPTH: 87.02 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ______
WELL LOCKED? ☒ YES ☐ NO
WELL DIA. ☐ 2 INCH ☒ 4 INCH ☐ 6 INCH ☐ ______
WATER LEVEL EQUIP USED: ☒ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 18.88 FT × ☐ .16 GAL/FT (2 IN.) ☒ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 12.27 GAL/VOL

240 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☒
CONCRETE COLLAR INTACT ☒
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR: PURGING / SAMPLING)

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☒	☐	SUBMERSIBLE PUMP	
☐	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Steam Clean Bailer Pump Hoses

FIELD ANALYSIS DATA

AMBIENT AIR VOA: — PPM
WELL MOUTH: — PPM
FIELD DATA COLLECTED: ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 10 GAL	@ 50 GAL	@ 100 GAL	@ 150 GAL	@ 240 GAL
TEMPERATURE, DEG C	[illegible]				
pH, units	6.9	7.0	6.7	6.7	6.7
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	1000	1000	1000	1000

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☒ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER: [illegible signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAO PHASE I RI/FS - ROUND 2 JOB NO. 2573.0041 DATE 5/31/90

SAMPLE LOCATION I.D. DMO - 03 - MWA LOCATION ACTIVITY START: 0845 END: 1140

WATER LEVEL / WELL DATA

WELL DEPTH 110.03 FT ☒ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☒ TOP OF CASING ☐ ______ CASING STICK-UP (FROM GROUND) 1.3 FT

WATER DEPTH 96.28 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ______

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☐ 2 INCH ☒ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP USED: ☒ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 13.75 FT × ☐ .16 GAL/FT (2 IN.) ☒ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 8.94 GAL/VOL; 30 TOTAL GAL PURGED

WELL INTEGRITY	YES	NO
PROT. CASING SECURE	☒	
CONCRETE COLLAR INTACT	☒	
OTHER ______		

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☒	☐	SUBMERSIBLE PUMP	
☐	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD:
STEAM CLEAN
BAILER
PUMP
HOSE

FIELD ANALYSIS DATA

AMBIENT AIR VOA 0 PPM WELL MOUTH ____ PPM FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 5 GAL	@ 30 GAL	@ 200 GAL	@ 30 GAL	@ ___ GAL
TEMPERATURE, DEG C	N/A	N/A	N/A	N/A	
pH, units	6.9	6.9	6.8	6.8	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	2300	1200	1200	1200	

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☒ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES.

SIGNATURE OF SAMPLER C. Hill

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT SIAD PHASE I RIFS JOB NO. 25730041 DATE 5/31/90

SAMPLE LOCATION I.D. DWO - 04 - MWA LOCATION ACTIVITY START: 1215 END: 1425

WATER LEVEL / WELL DATA

WELL DEPTH 110.00 FT ☒ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☒ TOP OF CASING ☐ ______ CASING STICK-UP (FROM GROUND) 1.4 FT

WATER DEPTH 96.48 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ______

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☐ 2 INCH ☒ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP USED: ☒ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 13.52 FT x ☐ .16 GAL/FT (2 IN.) ☒ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ __ GAL/FT (__ IN.) = 8.79 GAL/VOL; 150 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☒
CONCRETE COLLAR INTACT ☒
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR: PURGING / SAMPLING

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☒	☐	SUBMERSIBLE PUMP	
☐	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam Clean Bailers Pump Hoses

FIELD ANALYSIS DATA

AMBIENT AIR VOA — PPM WELL MOUTH — PPM FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 10 GAL	@ 50 GAL	@ 100 GAL	@ 150 GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	7.5	7.0	6.8	6.8	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1900	1100	1100	1100	

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☒ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES.

SIGNATURE OF SAMPLER

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT SIAP PHASE I RI/FS JOB NO. 25730041 DATE 5/31/90

SAMPLE LOCATION I.D. DMO-05-MWA LOCATION ACTIVITY START: 1425 END: 1545

WATER LEVEL / WELL DATA

WELL DEPTH 109.98 FT ☒ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☒ TOP OF CASING ☐ ____ CASING STICK-UP (FROM GROUND) 1.2 FT

WATER DEPTH 95.55 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ____

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☐ 2 INCH ☒ 4 INCH ☐ 6 INCH ☐ ____

WATER LEVEL EQUIP USED: ☒ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ____

HEIGHT OF WATER COLUMN 14.43 FT x ☐ .16 GAL/FT (2 IN.) ☒ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 9.37 GAL/VOL ; ~40 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☒ ☐
CONCRETE COLLAR INTACT ☒ ☐
OTHER ____ ☐ ☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR:

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☒	☐	SUBMERSIBLE PUMP	
☐	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam Clean Pump Bailers Hoses

FIELD ANALYSIS DATA

AMBIENT AIR VOA – PPM WELL MOUTH – PPM

FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 5 GAL	@ 10 GAL	@ 20 GAL	@ 30 GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	6.9	6.9	6.9	6.9	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	1800	1000	1000	

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☒ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [illegible signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD PHASE 1 RI — JOB NO. 2573 CC41 — DATE: 6/5/92

SAMPLE LOCATION I.D.: DS3-4-MW4 — LOCATION ACTIVITY START: 1020 END: 1130

WATER LEVEL / WELL DATA

WELL DEPTH: 41.70 FT — ☒ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☒ TOP OF CASING ☐ ____ — CASING STICK-UP (FROM GROUND): 2.0 FT

WATER DEPTH: 24.74 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ____

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☒ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ____

WATER LEVEL EQUIP USED: ☒ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ____

HEIGHT OF WATER COLUMN: 16.96 FT × ☒ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 2.71 GAL/VOL

47 TOTAL GAL PURGED

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☒	
CONCRETE COLLAR INTACT	☒	
OTHER ____		

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR:)

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☒	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	____	

DECONTAMINATION METHOD: Steam Clean Bailers + Sounder

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM — WELL MOUTH ____ PPM — FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 2 GAL	@ 47 GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	6.3	6.0			
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	7300	10000			

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☒ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: S.A.D PHASE I RI | JOB NO. 2573CC41 | DATE 2/8/92

SAMPLE LOCATION I.D. TNT-01-MWA | LOCATION ACTIVITY START: 0755 END: 1008

WATER LEVEL / WELL DATA

WELL DEPTH 78.60 FT — ☑ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☑ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND) 2.6 FT

WATER DEPTH 58.15 FT — WELL MATERIAL: ☑ PVC ☐ SS ☐ ______ — WELL LOCKED? ☑ YES ☐ NO — WELL DIA. ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ______ — WATER LEVEL EQUIP USED: ☑ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 20.45 FT X ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 3.27 GAL/VOL; 57 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☑
CONCRETE COLLAR INTACT ☑
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR: PURGING SAMPLING — EQUIPMENT I.D.

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☑	☑	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Steam Clean Bailers + Wire

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM — WELL MOUTH ____ PPM — FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 2 GAL	@ 38 GAL	@ 50 GAL	@ 55 GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	7.2	7.0	6.8	6.8	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	860	1500	930	900	

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☑ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PAGE 1 OF 1

PROJECT S.A.D PHASE I RI | JOB NO. 2573C041 | DATE 6/5/90

SAMPLE LOCATION I.D. TNT-01-MWB | LOCATION ACTIVITY START: 1005 END: 1125

WATER LEVEL / WELL DATA

WELL DEPTH 102.98 FT — ☒ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☒ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND) 3.2 FT

WATER DEPTH 59.58 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ______

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☐ 2 INCH ☒ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP USED: ☒ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 43.40 FT × ☐ .16 GAL/FT (2 IN.) ☒ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 28.21 GAL/VOL

390 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☒
CONCRETE COLLAR INTACT ☒
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR:

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☒	☐	SUBMERSIBLE PUMP	
☐	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Steam Clean Bailer Pump hoses

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM

FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 20 GAL	@ 120 GAL	@ 180 GAL	@ 300 GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	6.5	5.8	6.5	6.5	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	1000	1000	1000	

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☐ CLOUDY
☒ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD PHASE I RI   JOB NO. 2573.0041   DATE 6/5/8?

SAMPLE LOCATION I.D. TNT-Ø1-MWC   LOCATION ACTIVITY START: 0800 END: 0955

WATER LEVEL / WELL DATA

WELL DEPTH: 140.19 FT — ☒ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☒ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND) 2.2 FT

WATER DEPTH: 58.51 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ______

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☐ 2 INCH ☒ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP USED: ☒ ELECT COND PROBE — FLOAT ACTIVATED — PRESS. TRANSDUCER — ______

HEIGHT OF WATER COLUMN 81.68 FT × ☐ .16 GAL/FT (2 IN.) ☒ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 53.09 GAL/VOL

420 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☒
CONCRETE COLLAR INTACT ☒
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR: PURGING / SAMPLING)

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☒	☐	SUBMERSIBLE PUMP	
☐	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam clean Pump Bailer Hoses

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM   WELL MOUTH ____ PPM   FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 20 GAL	@ 200 GAL	@ 320 GAL	@ 420 GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	6.6	6.6	6.6	6.6	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	1000	1000	1000	

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☐ CLOUDY ☒ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: 5140 PHASE I 21 | JOB NO.: 2573 CC41 | DATE: 6/4/90

SAMPLE LOCATION I.D.: TNT-2-MW4 | LOCATION ACTIVITY START: 1400 END: 1530

WATER LEVEL / WELL DATA

WELL DEPTH: 75.74 FT — [X] MEASURED [ ] HISTORICAL — [ ] TOP OF WELL [X] TOP OF CASING [ ] ______

CASING STICK-UP (FROM GROUND): 2.0 FT

WATER DEPTH: 56.67 FT

WELL MATERIAL: [X] PVC [ ] SS [ ] ______

WELL LOCKED? [X] YES [ ] NO

WELL DIA.: [X] 2 INCH [ ] 4 INCH [ ] 6 INCH [ ] ______

WATER LEVEL EQUIP USED: [X] ELECT. COND. PROBE [ ] FLOAT ACTIVATED [ ] PRESS. TRANSDUCER [ ] ______

HEIGHT OF WATER COLUMN: 19.07 FT × [X] .16 GAL/FT (2 IN.) [ ] .65 GAL/FT (4 IN.) [ ] 1.5 GAL/FT (6 IN.) [ ] ___ GAL/FT (___ IN.) = 3.05 GAL/VOL

55 TOTAL GAL PURGED

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	X
CONCRETE COLLAR INTACT	X
OTHER ______	

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
[ ]	[ ]	PERISTALTIC PUMP	
[ ]	[ ]	SUBMERSIBLE PUMP	
[X]	[X]	BAILER	
[ ]	[ ]	PVC/SILICON TUBING	
[ ]	[ ]	TEFLON/SILICON TUBING	
[ ]	[ ]	AIR LIFT	
[ ]	[ ]	HAND PUMP	
	[ ]	IN-LINE FILTER	
	[ ]	PRESS/VAC FILTER	
[ ]	[ ]	______	

DECONTAMINATION METHOD: Steam Clean SS Bailer, Teflon Bailer, SS wire

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM | WELL MOUTH ____ PPM | FIELD DATA COLLECTED [ ] IN-LINE [X] IN CONTAINER

PURGE DATA	10 GAL	30 GAL	55 GAL	___ GAL	___ GAL
TEMPERATURE, DEG C					
pH, units	6.4	6.3	6.2		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1100	1300	1300		

SAMPLE OBSERVATIONS: [ ] TURBID [X] COLORED [X] CLOUDY [ ] CLEAR [ ] ODOR

SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT S.A.D PHASE 1 , 2 1 JOB NO. 2573 0041 DATE 6/4/90

SAMPLE LOCATION I.D. TNT-2-MWB LOCATION ACTIVITY START: 1030 END: 1150

WATER LEVEL / WELL DATA

WELL DEPTH 101.03 FT ☒ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☒ TOP OF CASING ☐ ______ CASING STICK-UP (FROM GROUND) 1.9 FT

WATER DEPTH 56.68 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ______

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☐ 2 INCH ☒ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP USED: ☒ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 44.35 FT x ☐ .16 GAL/FT (2 IN.) ☒ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 28.83 GAL/VOL; 300 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☒ YES
CONCRETE COLLAR INTACT ☒ YES
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR: PURGING SAMPLING

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☒	☐	SUBMERSIBLE PUMP	
☐	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Steam Clean Bailer Pump -uses

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM

FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 10 GAL	@ 120 GAL	@ 240 GAL	@ 300 GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	7.6	7.8	7.7	7.8	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	920	900	900	

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☐ CLOUDY
☒ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD PHASE I RI | JOB NO. 2573 0041 | DATE 6/4/90

SAMPLE LOCATION I.D. TNT-2-MWC | LOCATION ACTIVITY START: 0850 END: 1030

WATER LEVEL / WELL DATA

WELL DEPTH 142.07 FT — ☒ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☒ TOP OF CASING ☐ ______

CASING STICK-UP (FROM GROUND) 3.0 FT

WATER DEPTH 57.32 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ______

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☐ 2 INCH ☒ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP USED: ☒ ELECT. COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 84.75 FT × ☐ .16 GAL/FT (2 IN.) ☒ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 55.09 GAL/VOL

400 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☒ ☐
CONCRETE COLLAR INTACT ☒ ☐
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR:

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☒	☐	SUBMERSIBLE PUMP	
☐	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam Clean Bailer Pump Hoses

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM

FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 10 GAL	@ 240 GAL	@ 300 GAL	@ 360 GAL	@ 400 GAL
TEMPERATURE, DEG C					
pH, units	7.8	7.4	7.6	7.6	7.6
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	760	800	910	920	920

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☐ CLOUDY
☒ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: 5140 PHASE I RI | JOB NO. 2573.0041 | DATE 6/8/90

SAMPLE LOCATION I.D. TNT-03/MWA | LOCATION ACTIVITY START: 1140 END: 1250

WATER LEVEL / WELL DATA

WELL DEPTH 67.82 FT — ☒ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☒ TOP OF CASING ☐ ____ — CASING STICK-UP (FROM GROUND) 3.2 FT

WATER DEPTH 56.08 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ____

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☒ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ____

WATER LEVEL EQUIP USED: ☒ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ____

HEIGHT OF WATER COLUMN 11.74 FT × ☒ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.88 GAL/VOL; 33 TOTAL GAL PURGED

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☒	☐
CONCRETE COLLAR INTACT	☒	☐
OTHER ____	☐	☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR:)

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☒	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam Clean Bailers + wire

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM — WELL MOUTH ____ PPM — FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 2 GAL	@ 20 GAL	@ 33 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	6.8	6.9	6.9		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	1000	1000		

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☒ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES.

SIGNATURE OF SAMPLER [illegible signature]

James M. Montgomery
Consulting Engineers, Inc.

PAGE 1 OF 1

PROJECT: SIAD PHASE 1 RI
JOB NO. 2573.0041
DATE 6/8/90
SAMPLE LOCATION I.D. TNT-04-MWA
LOCATION ACTIVITY START: 1255 END: 1400

WATER LEVEL / WELL DATA

WELL DEPTH 68.76 FT
☒ MEASURED ☐ HISTORICAL
☐ TOP OF WELL ☒ TOP OF CASING ☐ ____
CASING STICK-UP (FROM GROUND) 2.5 FT

WATER DEPTH 56.37 FT
WELL MATERIAL: ☒ PVC ☐ SS ☐ ____
WELL LOCKED? ☒ YES ☐ NO
WELL DIA. ☒ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ____
WATER LEVEL EQUIP. USED: ☒ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ____

HEIGHT OF WATER COLUMN 12.39 FT x ☒ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.98 GAL/VOL; 30 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☒ ☐
CONCRETE COLLAR INTACT ☒ ☐
OTHER ____ ☐ ☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR: PURGING / SAMPLING)

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☒	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam Clean Bailers + Wire

FIELD ANALYSIS DATA

AMBIENT AIR VOA ___ PPM WELL MOUTH ___ PPM
FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	● 3 GAL	● 15 GAL	● 30 GAL	● ___ GAL	● ___ GAL
TEMPERATURE, DEG C					
pH, units	6.8	6.9	6.8		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	3	15	30		

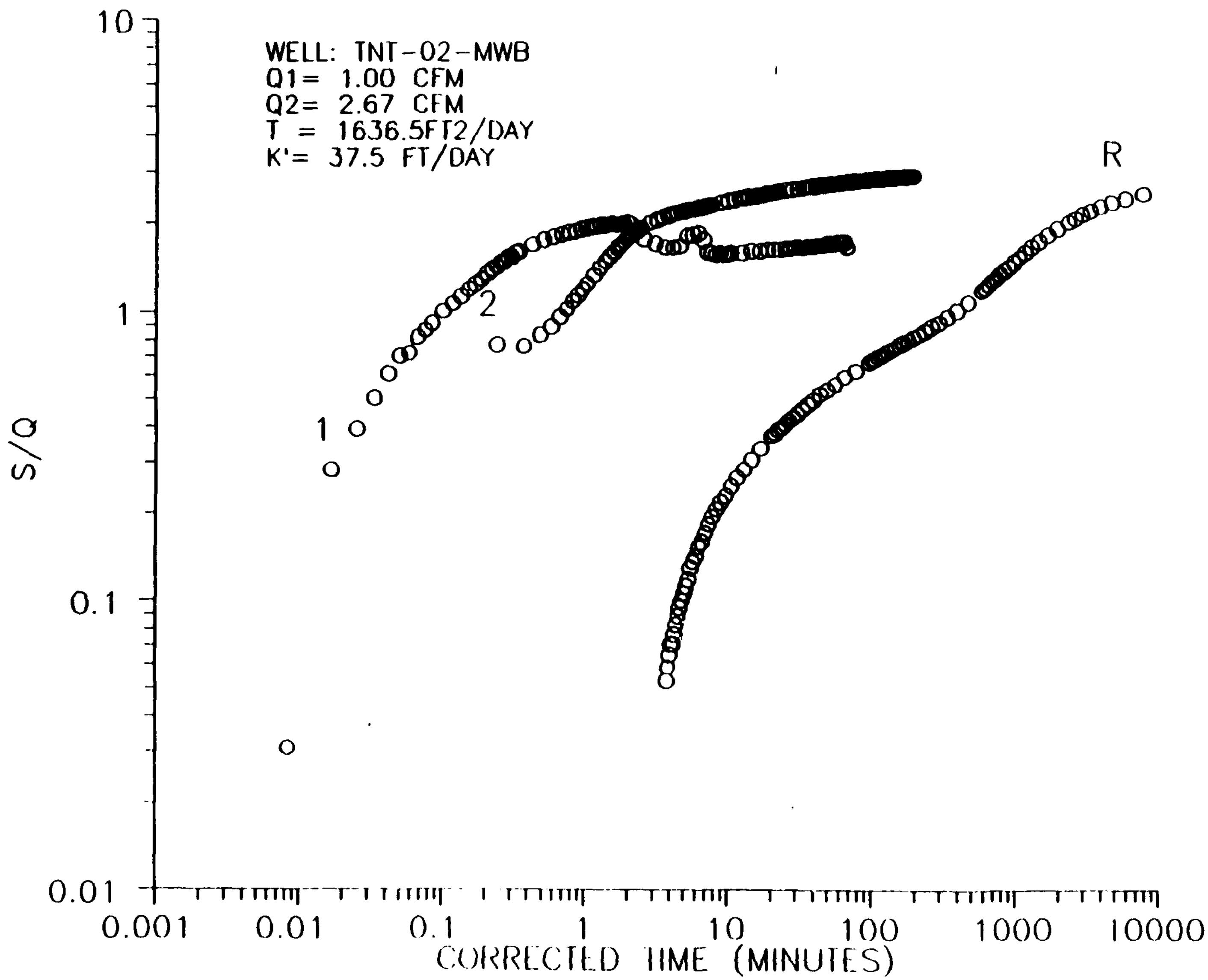
SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☒ CLOUDY
☐ CLEAR
☐ ODOR

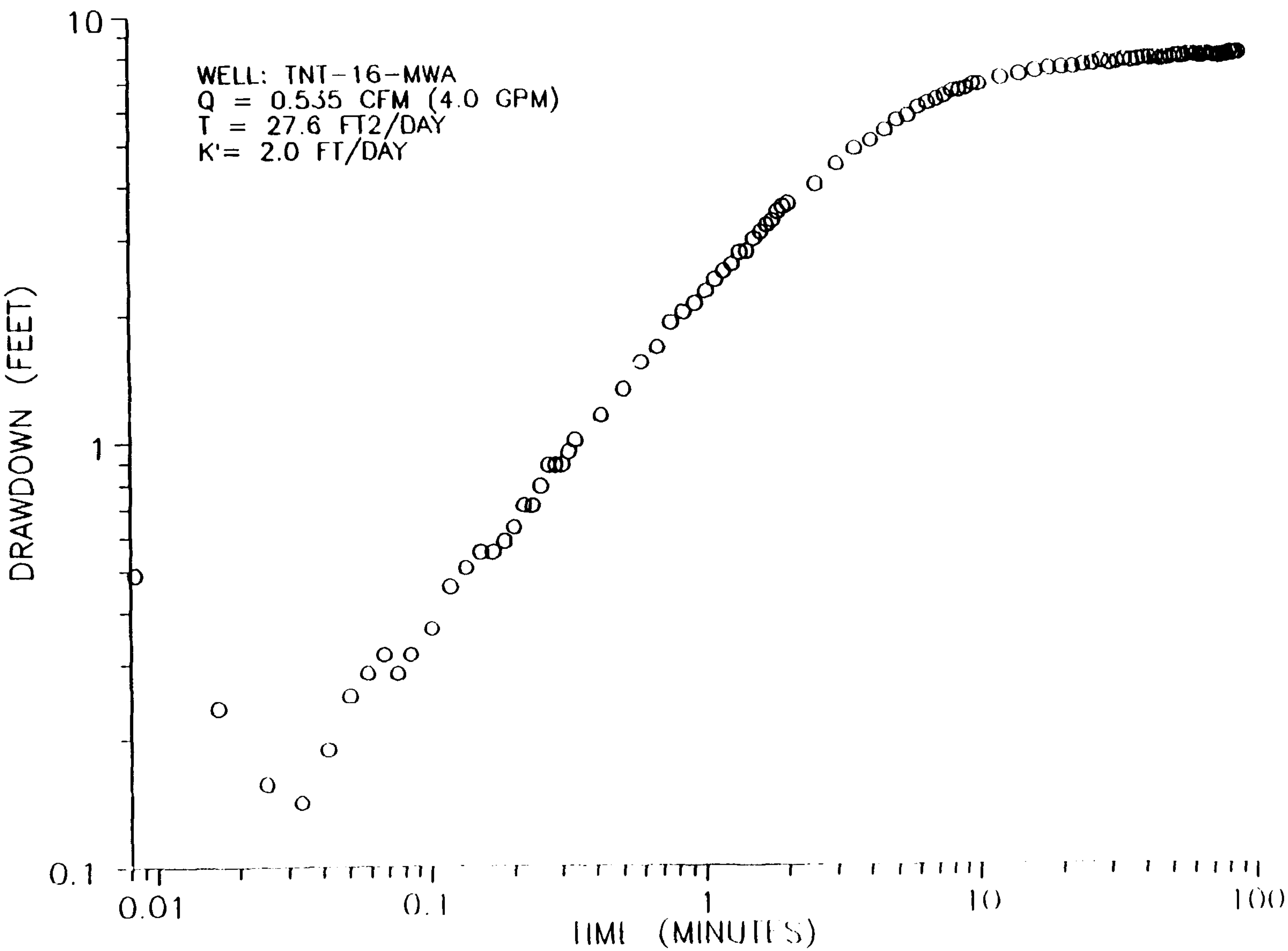
SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

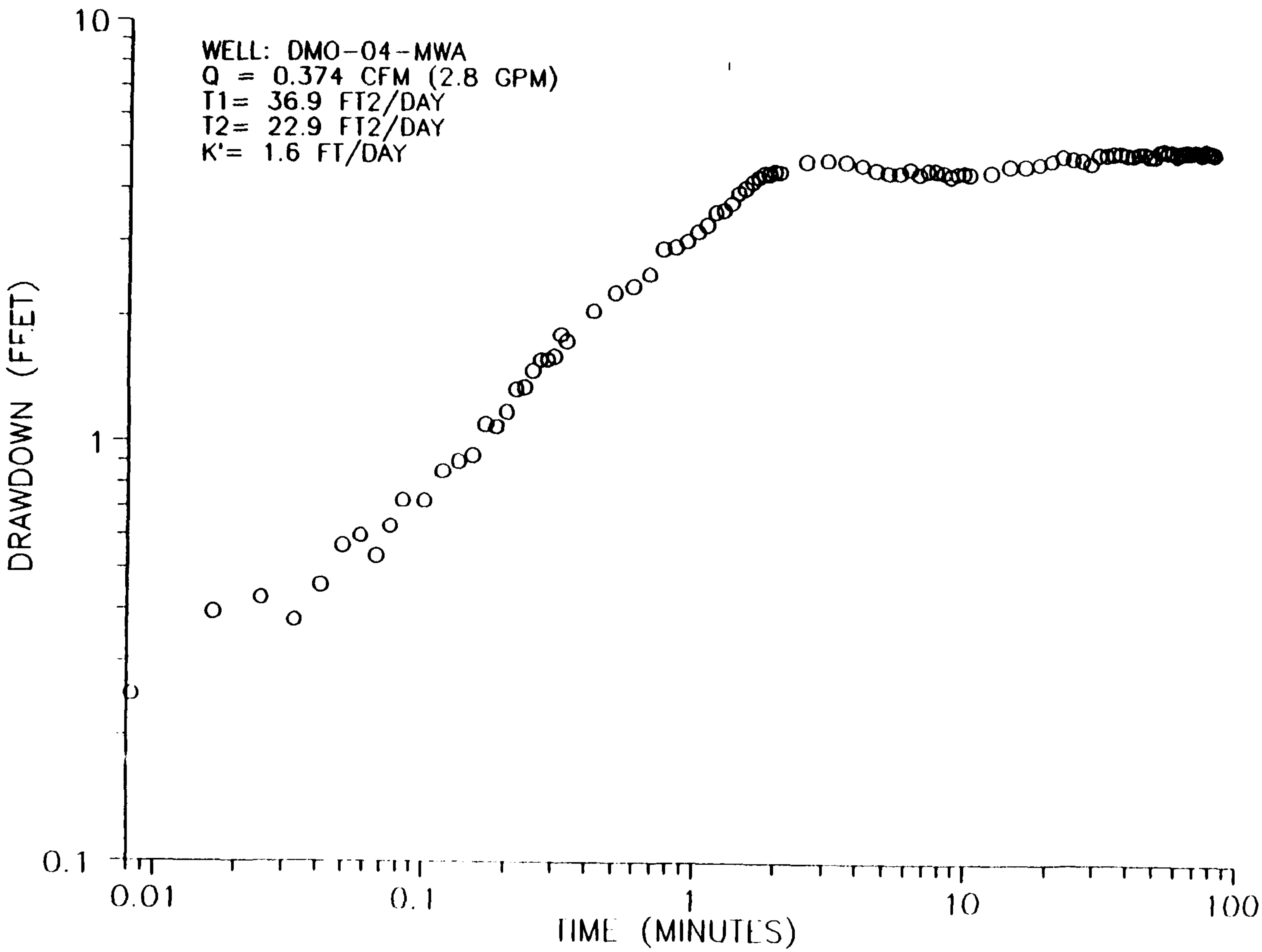
ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

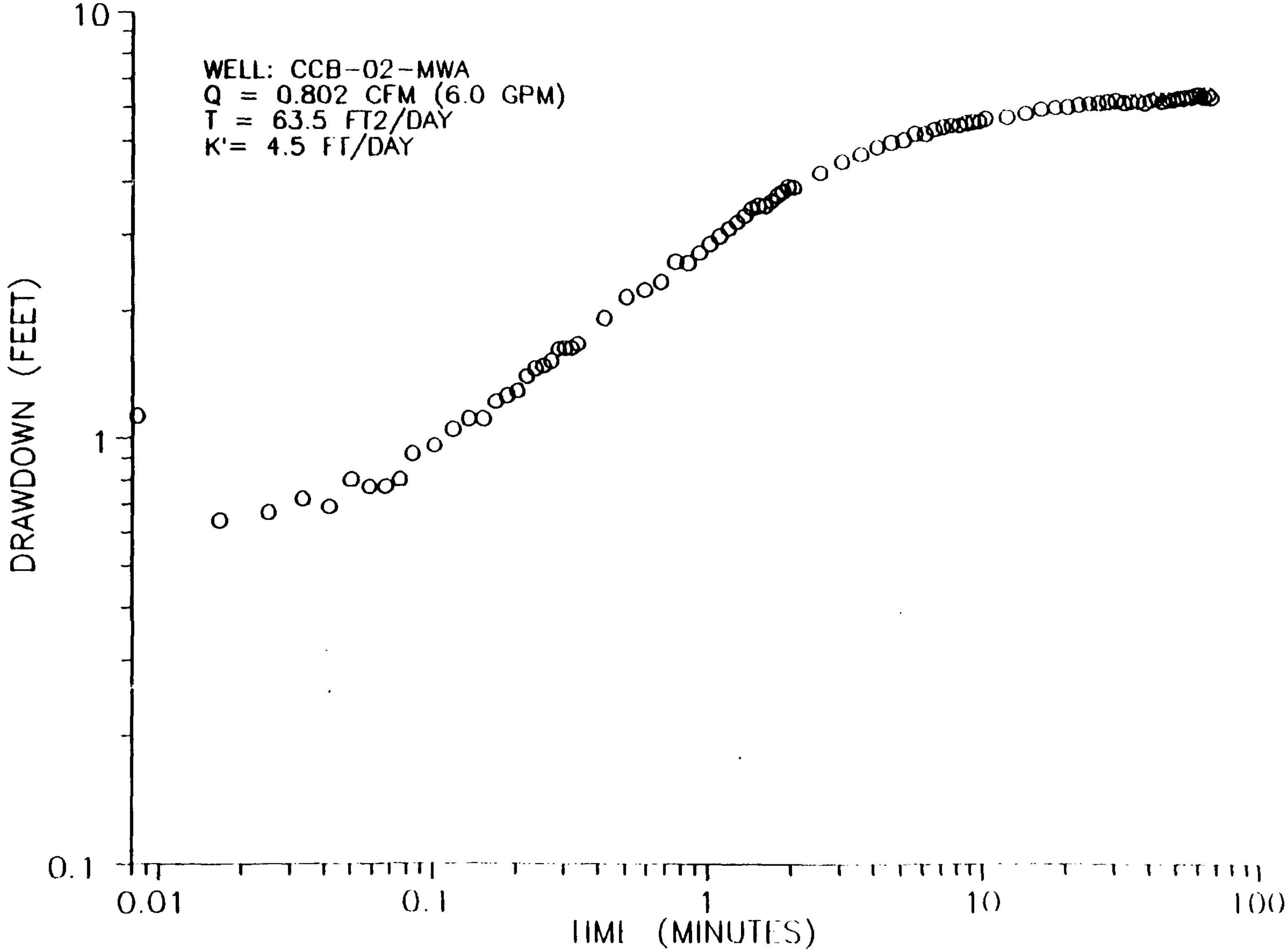
NOTES.

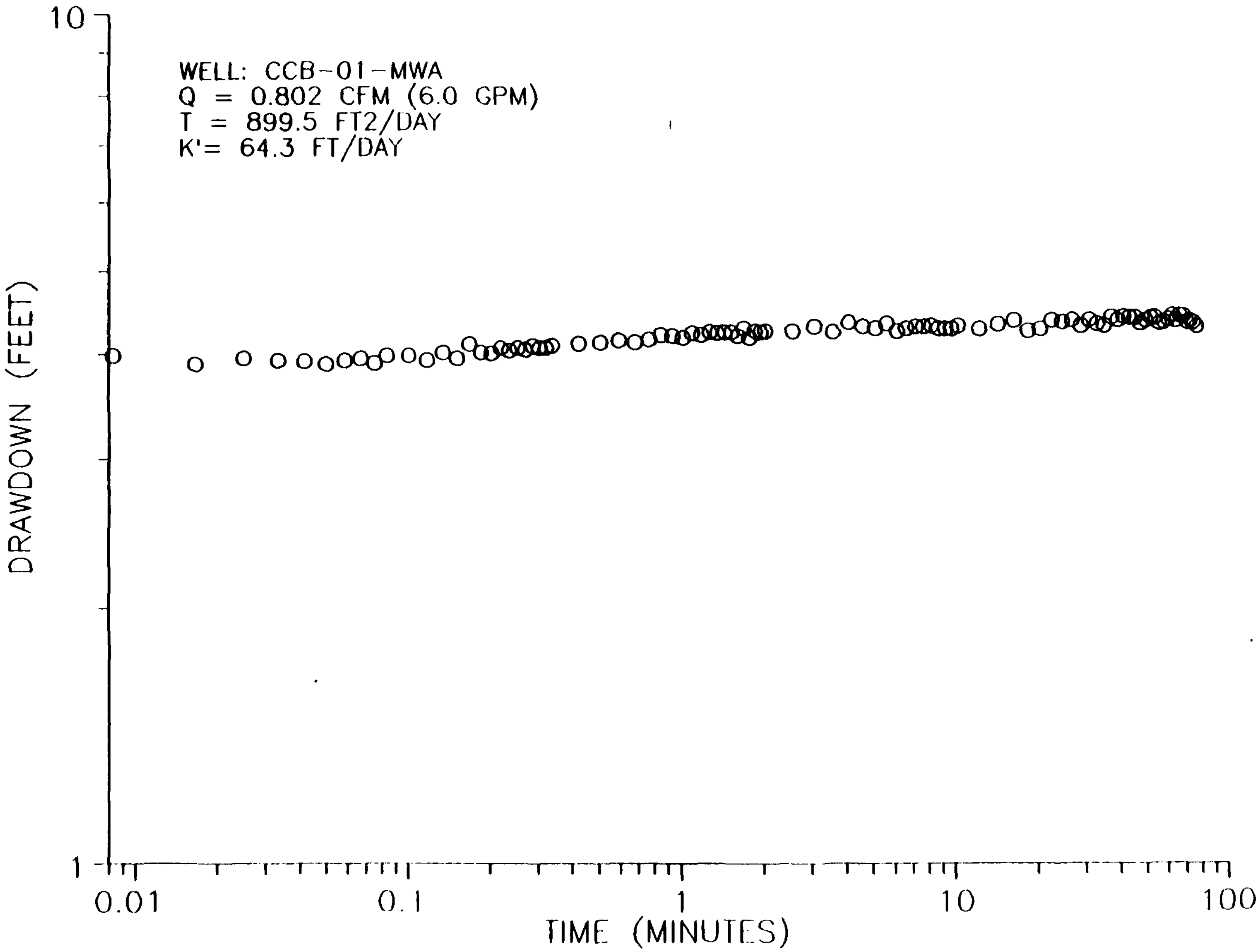
SIGNATURE OF SAMPLER

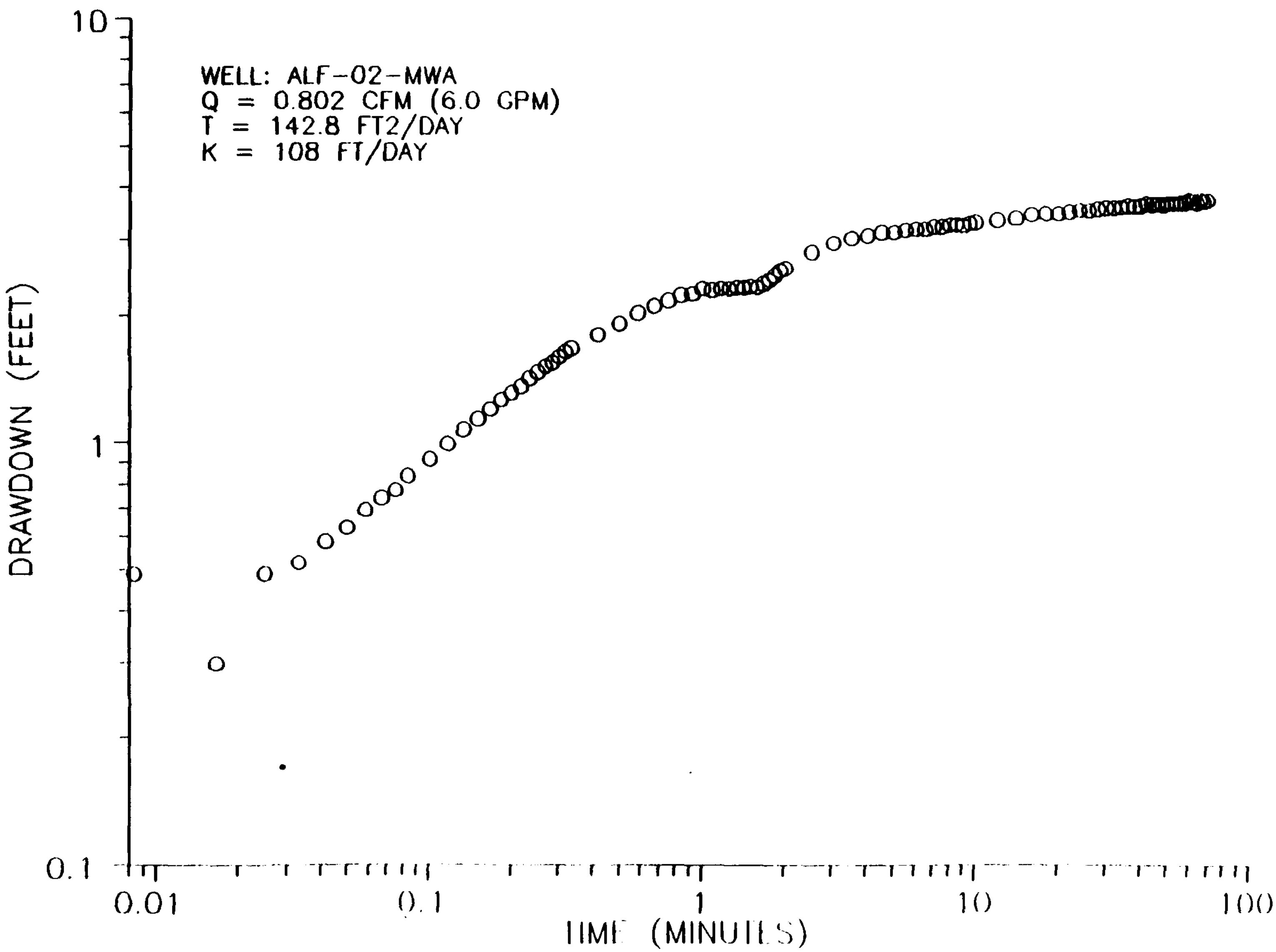

WELL: TNT-02-MWB
Q1= 1.00 CFM
Q2= 2.67 CFM
T = 1636.5FT2/DAY
K'= 37.5 FT/DAY
1
2
R
S/Q
10
1
0.1
0.01
0.001
0.01
0.1
1
10
100
1000
10000
CORRECTED TIME (MINUTES)

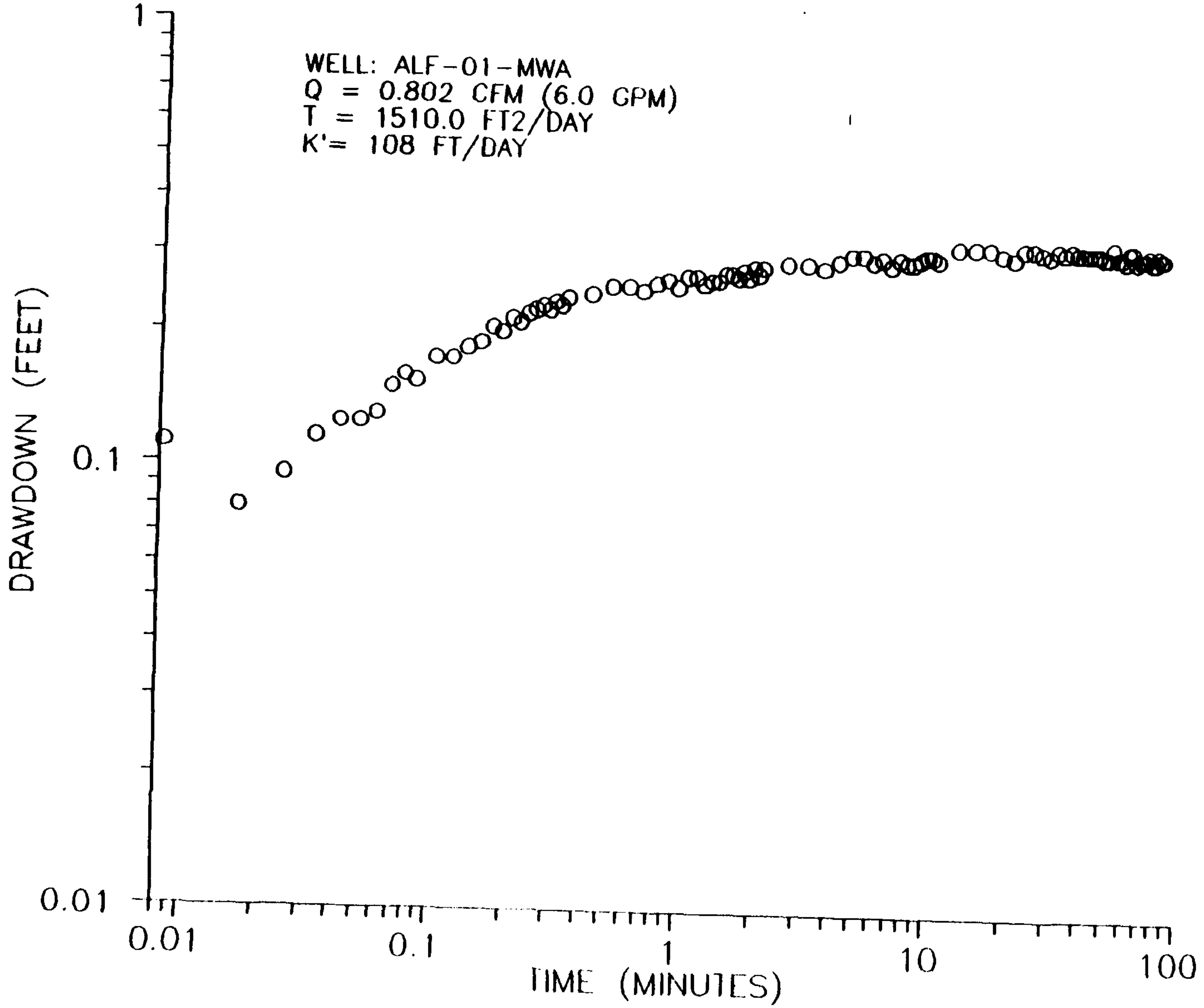

WELL: TNT-16-MWA
Q = 0.535 CFM (4.0 GPM)
T = 27.6 FT2/DAY
K'= 2.0 FT/DAY
DRAWDOWN (FEET)
10
1
0.1
0.01
0.1
1
10
100
TIME (MINUTES)


WELL: DMO-04-MWA
Q = 0.374 CFM (2.8 GPM)
T1= 36.9 FT2/DAY
T2= 22.9 FT2/DAY
K'= 1.6 FT/DAY
DRAWDOWN (FEET)
10
1
0.1
0.01
0.1
1
10
100
TIME (MINUTES)

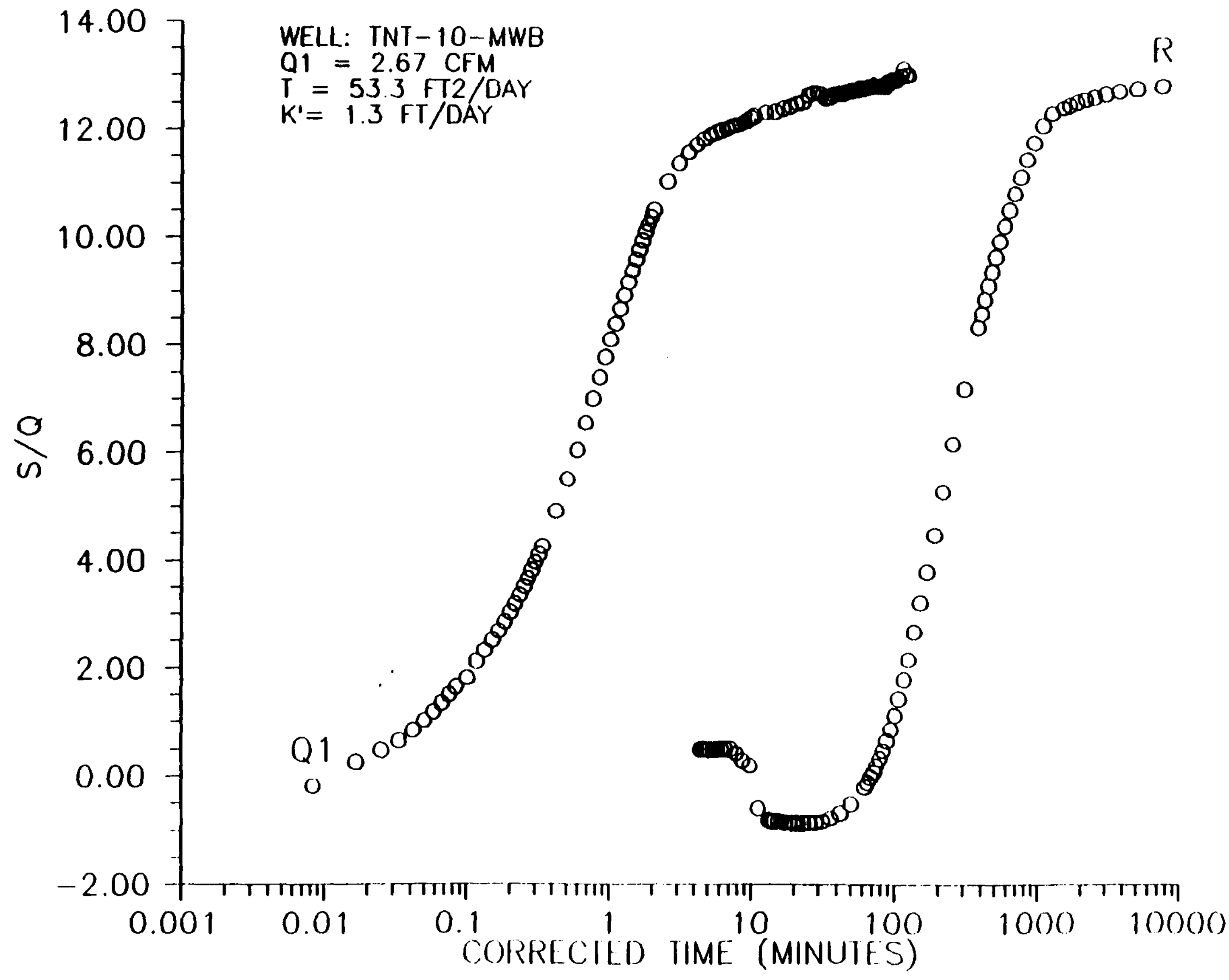

WELL: CCB-02-MWA
Q = 0.802 CFM (6.0 GPM)
T = 63.5 FT2/DAY
K'= 4.5 FT/DAY
DRAWDOWN (FEET)
10
1
0.1
0.01
0.1
1
10
100
TIME (MINUTES)

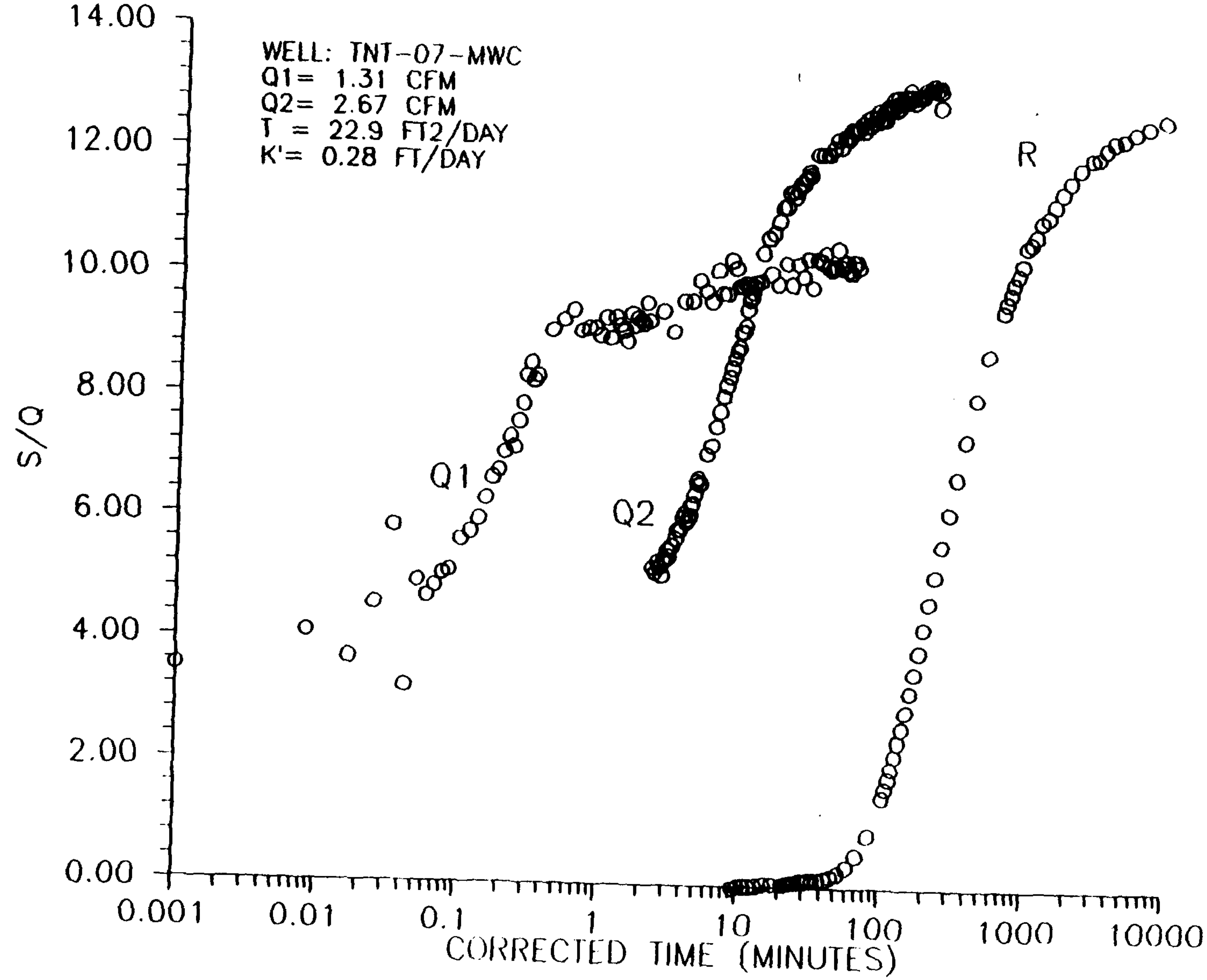

WELL: CCB-01-MWA
Q = 0.802 CFM (6.0 GPM)
T = 899.5 FT2/DAY
K'= 64.3 FT/DAY
10
1
DRAWDOWN (FEET)
0.01
0.1
1
10
100
TIME (MINUTES)


WELL: ALF-02-MWA
Q = 0.802 CFM (6.0 GPM)
T = 142.8 FT2/DAY
K = 108 FT/DAY
DRAWDOWN (FEET)
10
1
0.1
0.01
0.1
1
10
100
TIME (MINUTES)

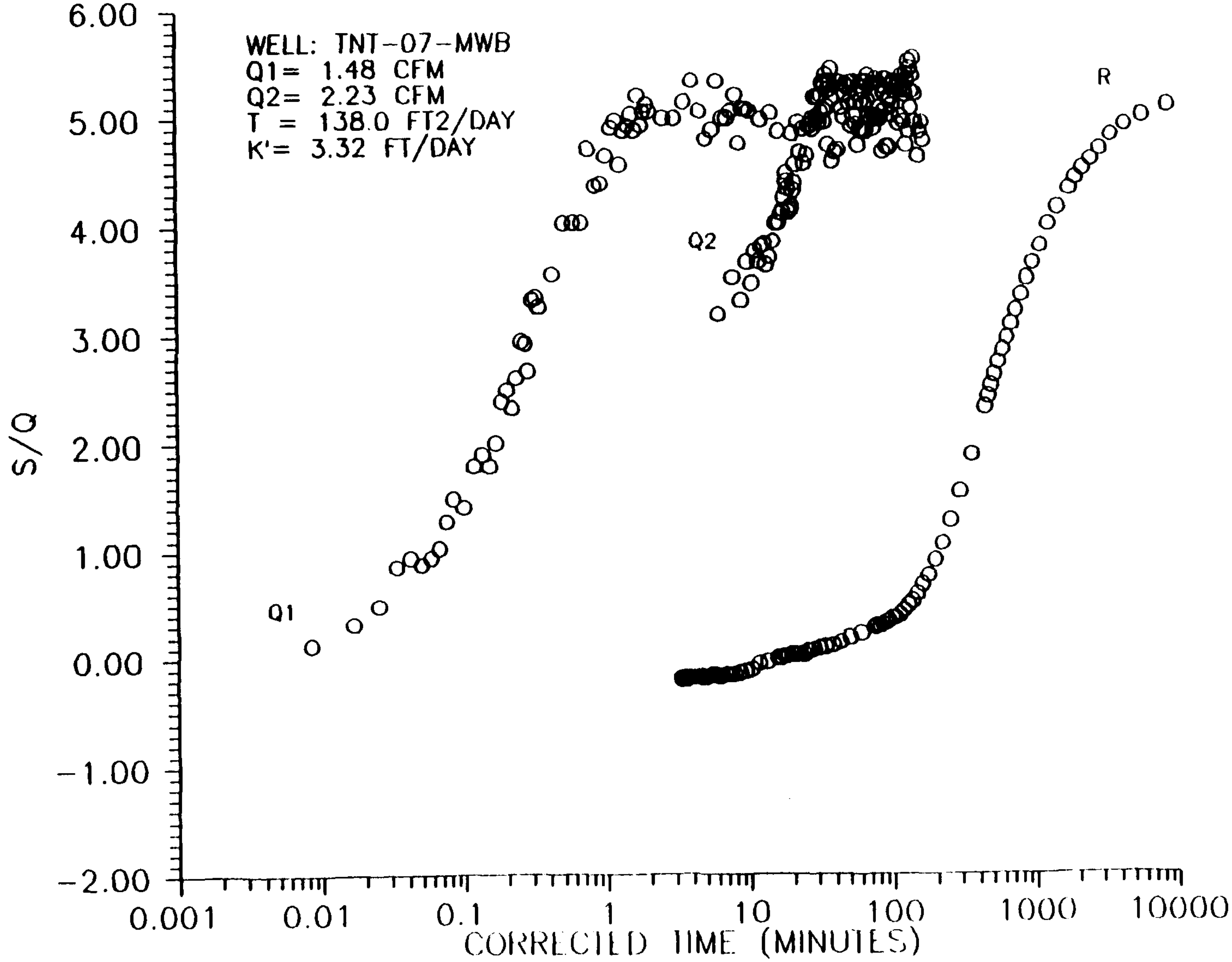


WELL: ALF-01-MWA
Q = 0.802 CFM (6.0 GPM)
T = 1510.0 FT2/DAY
K'= 108 FT/DAY
DRAWDOWN (FEET)
TIME (MINUTES)
1
0.1
0.01
0.01
0.1
1
10
100

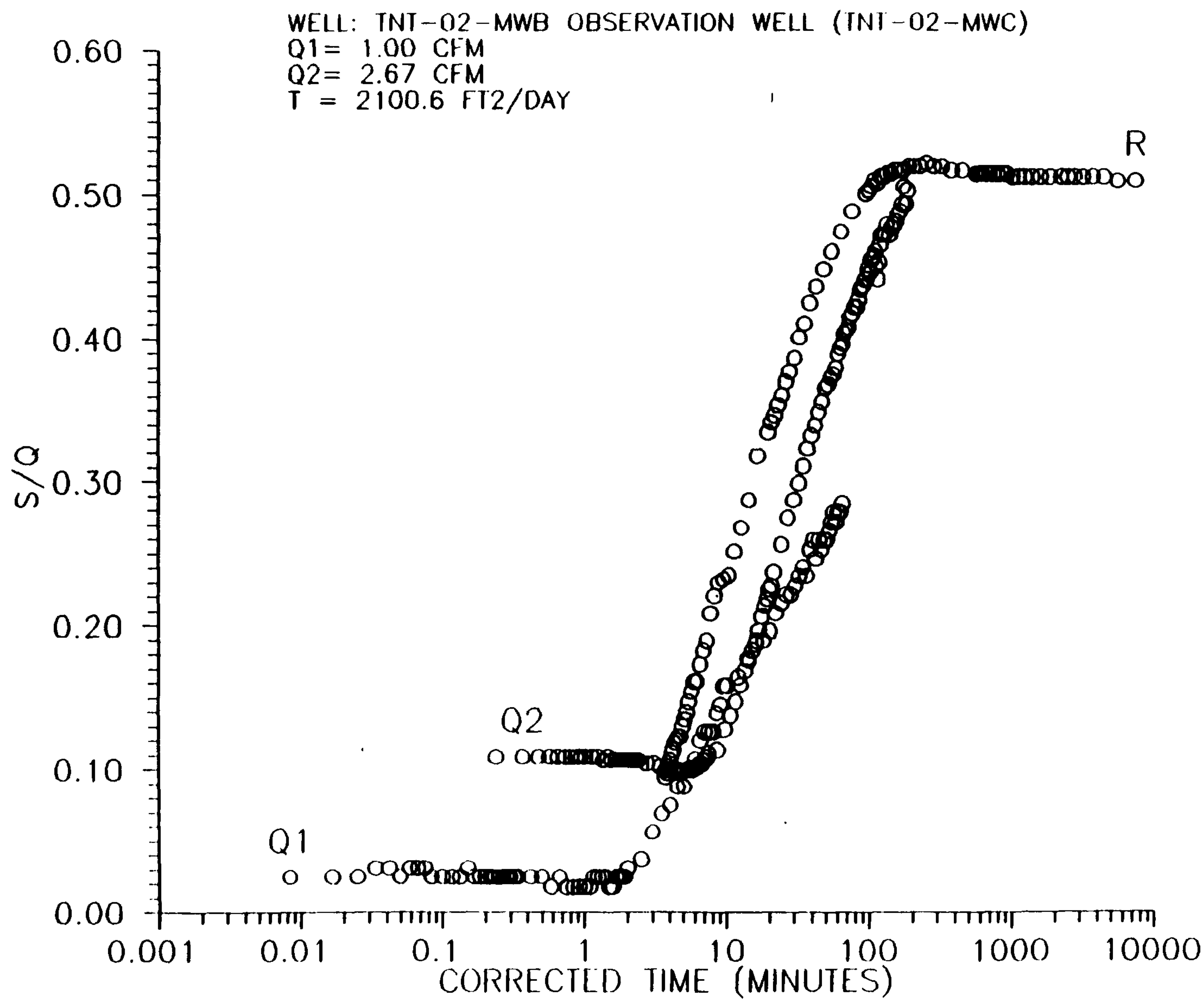

WELL: TNT-10-MWB
Q1 = 2.67 CFM
T = 53.3 FT2/DAY
K'= 1.3 FT/DAY
S/Q
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
0.001
0.01
0.1
1
10
100
1000
10000
CORRECTED TIME (MINUTES)
Q1
R

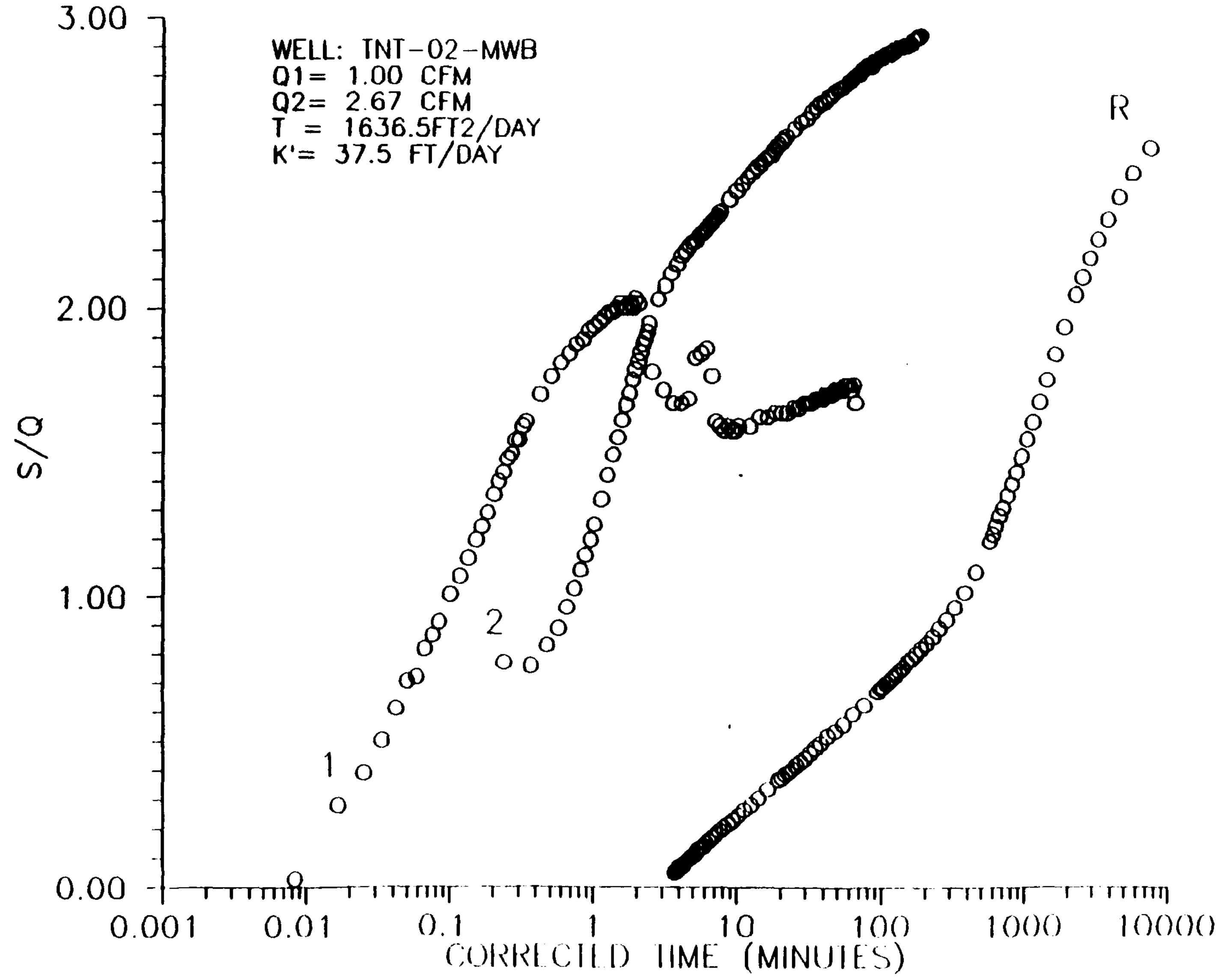


WELL: TNT-07-MWC
Q1= 1.31 CFM
Q2= 2.67 CFM
T = 22.9 FT2/DAY
K'= 0.28 FT/DAY
Q1
Q2
R
S/Q
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.001
0.01
0.1
1
10
100
1000
10000
CORRECTED TIME (MINUTES)

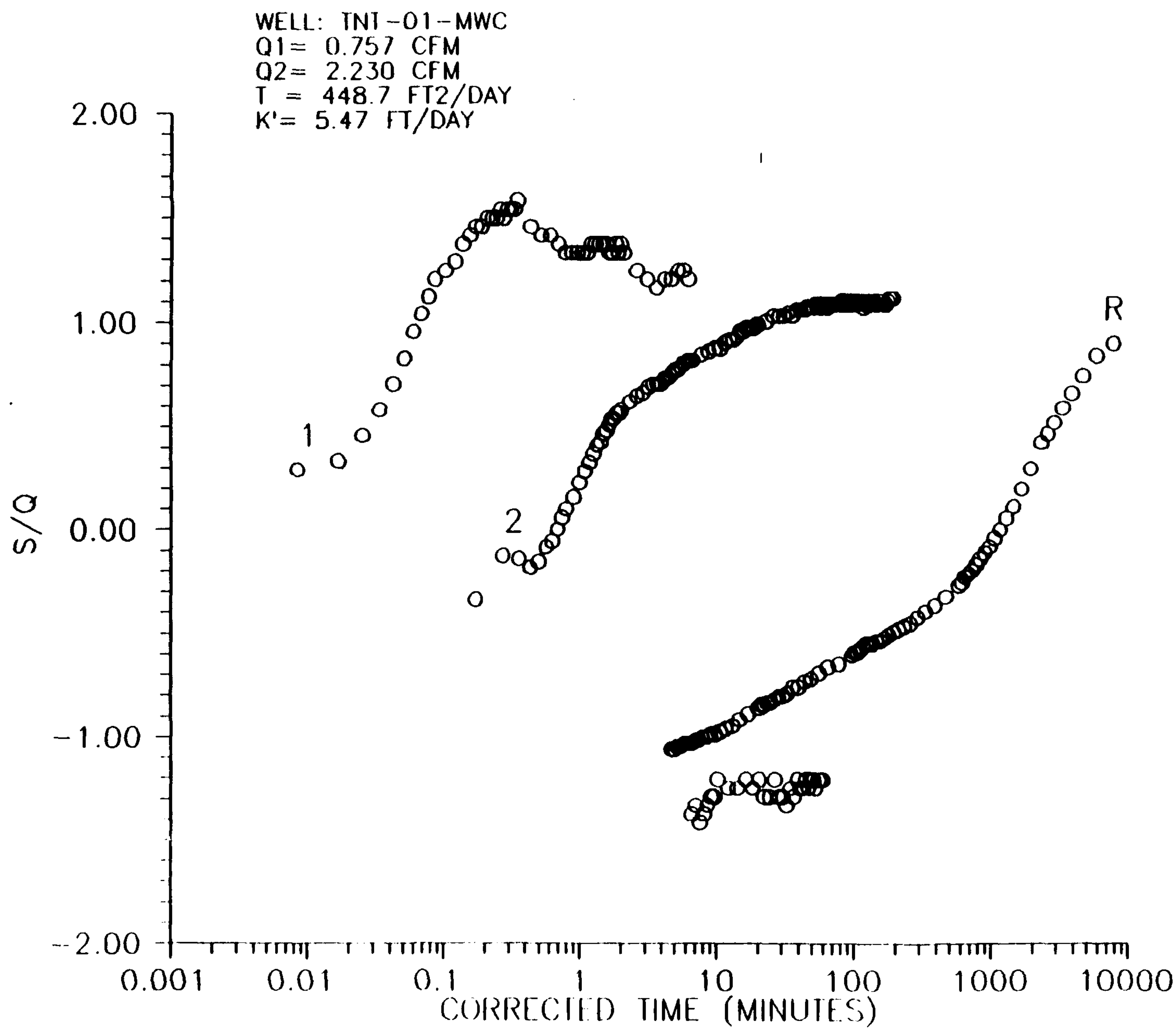


WELL: TNT-07-MWB
Q1= 1.48 CFM
Q2= 2.23 CFM
T = 138.0 FT2/DAY
K'= 3.32 FT/DAY
Q1
Q2
R
S/Q
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
0.001
0.01
0.1
1
10
100
1000
10000
CORRECTED TIME (MINUTES)

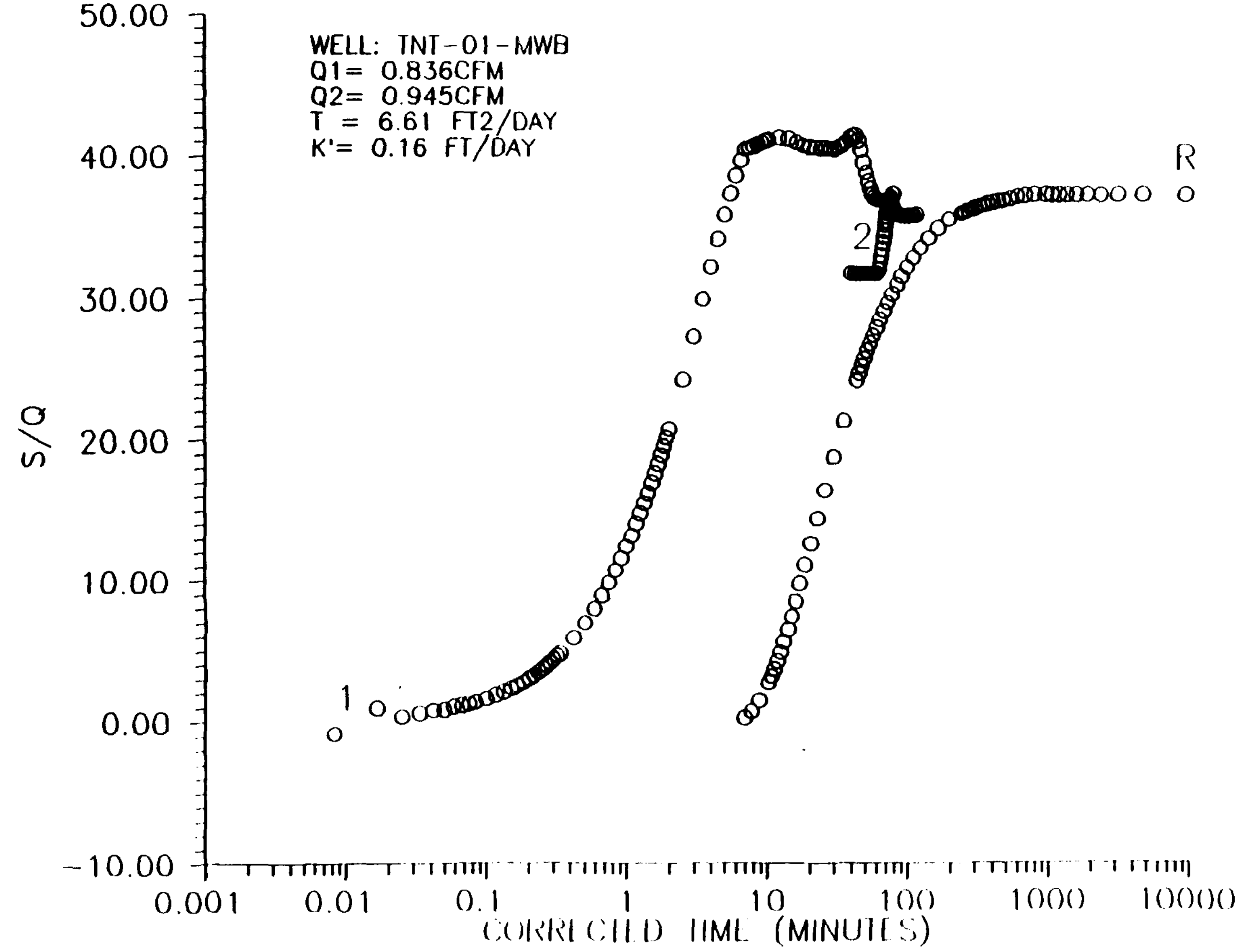

WELL: TNT-02-MWB OBSERVATION WELL (TNT-02-MWC)
Q1= 1.00 CFM
Q2= 2.67 CFM
T = 2100.6 FT2/DAY
S/Q
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.001
0.01
0.1
1
10
100
1000
10000
CORRECTED TIME (MINUTES)
Q1
Q2
R

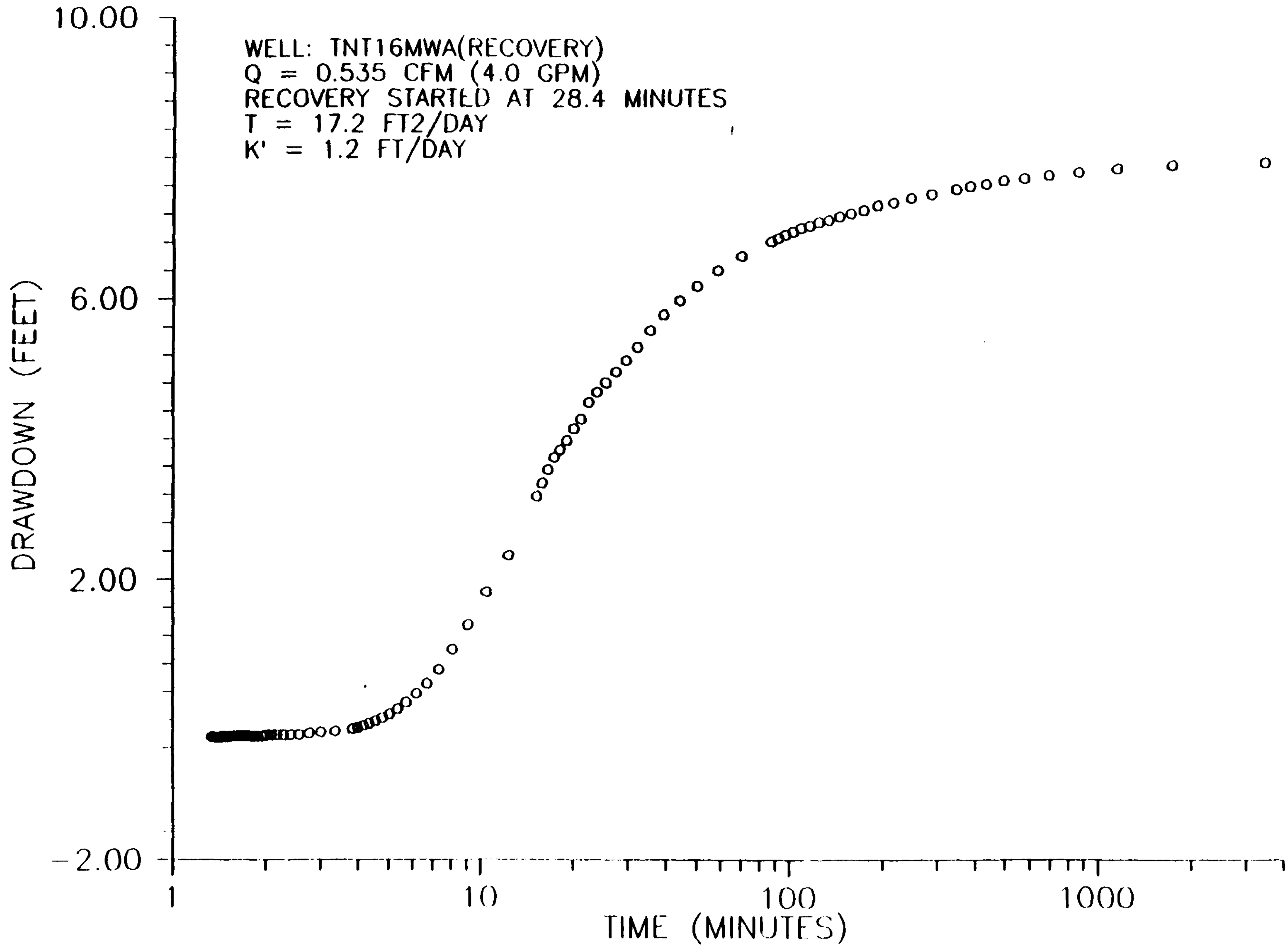


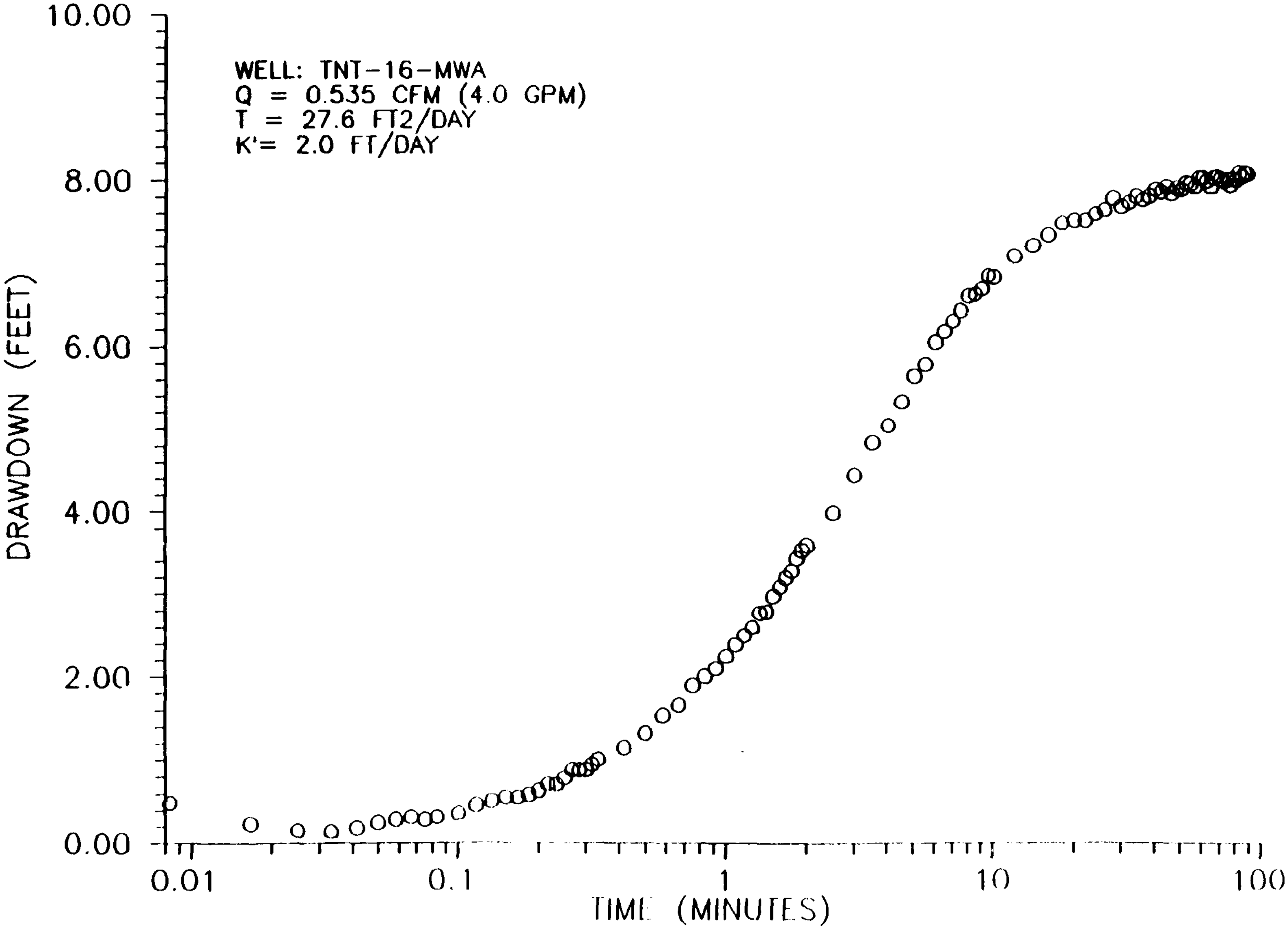
WELL: TNT-02-MWB
Q1= 1.00 CFM
Q2= 2.67 CFM
T = 1636.5FT2/DAY
K'= 37.5 FT/DAY
S/Q
3.00
2.00
1.00
0.00
0.001
0.01
0.1
1
10
100
1000
10000
CORRECTED TIME (MINUTES)
1
2
R

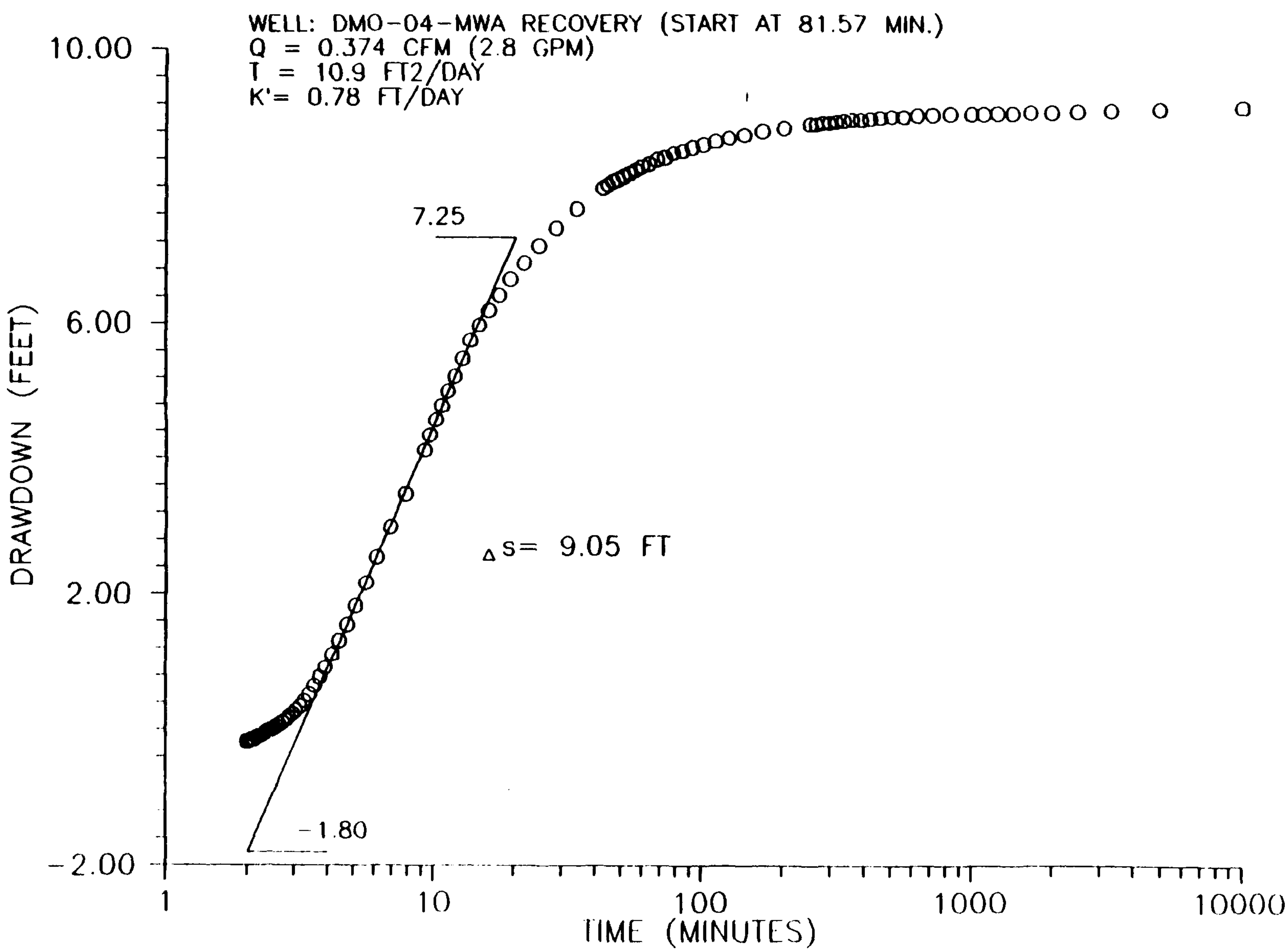


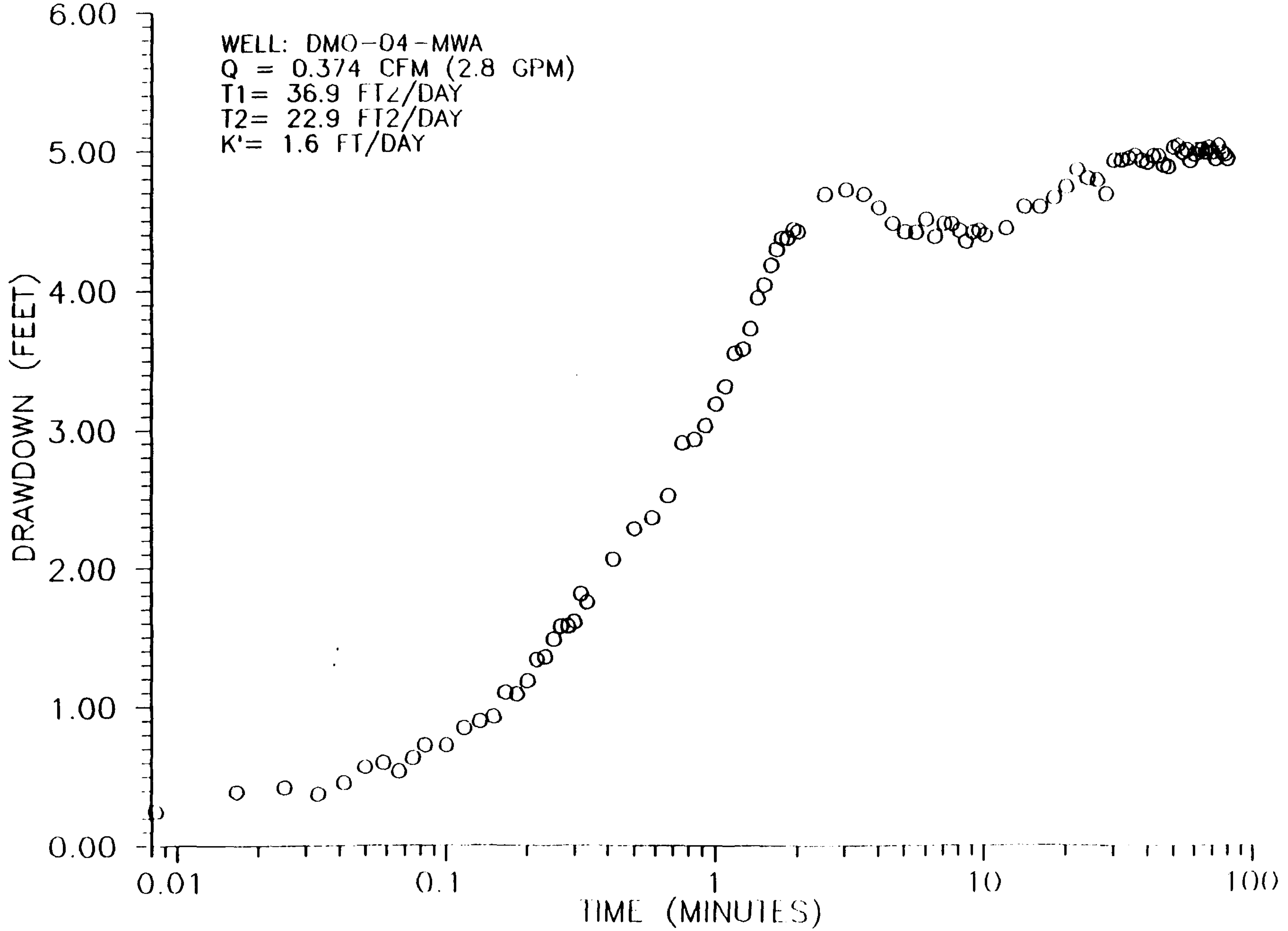
WELL: TNT-01-MWC
Q1= 0.757 CFM
Q2= 2.230 CFM
T = 448.7 FT2/DAY
K'= 5.47 FT/DAY
S/Q
2.00
1.00
0.00
-1.00
-2.00
1
2
R
0.001
0.01
0.1
1
10
100
1000
10000
CORRECTED TIME (MINUTES)

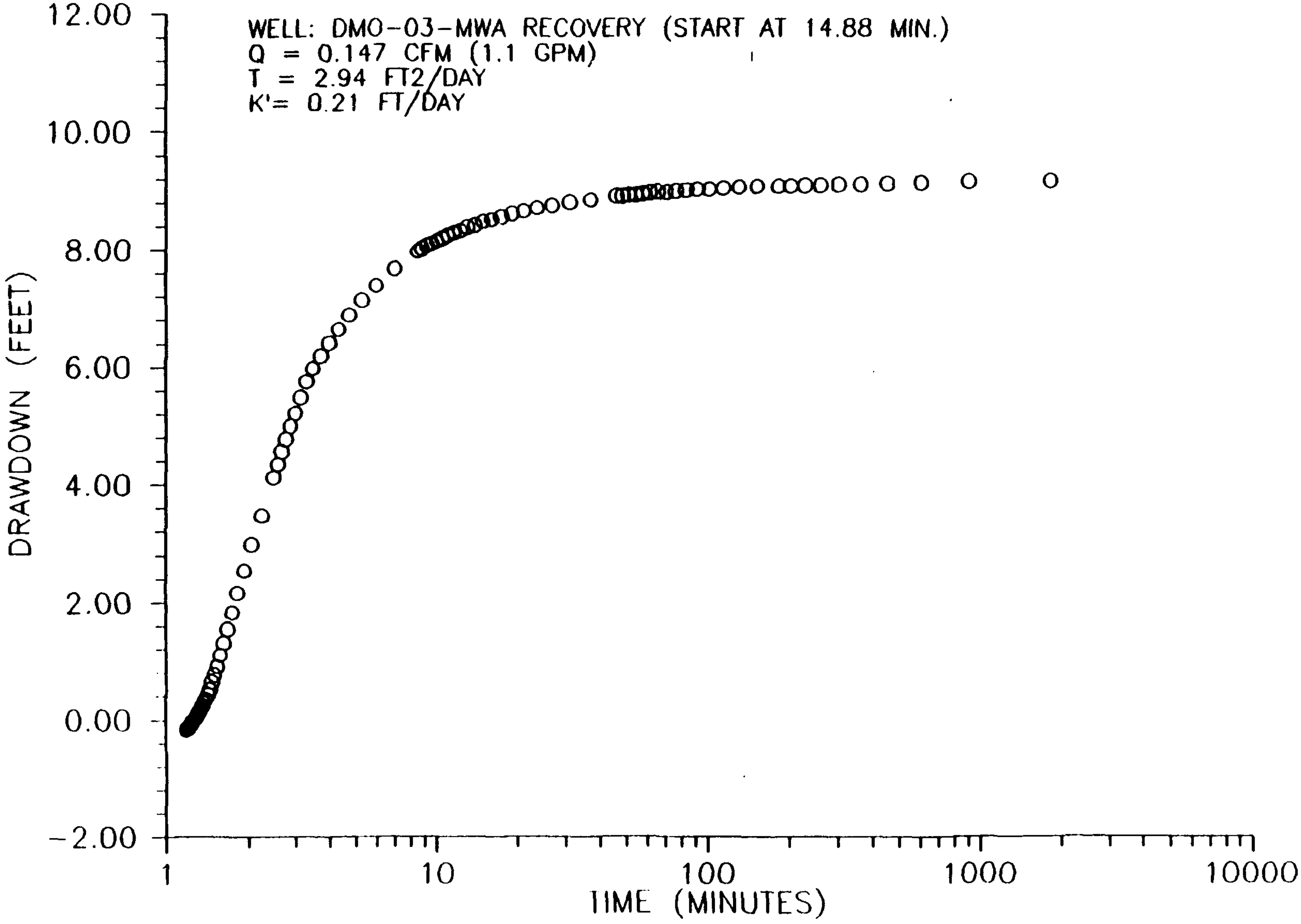

WELL: TNT-01-MWB
Q1= 0.836CFM
Q2= 0.945CFM
T = 6.61 FT2/DAY
K'= 0.16 FT/DAY
S/Q
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
0.001
0.01
0.1
1
10
100
1000
10000
CORRECTED TIME (MINUTES)
1
2
R

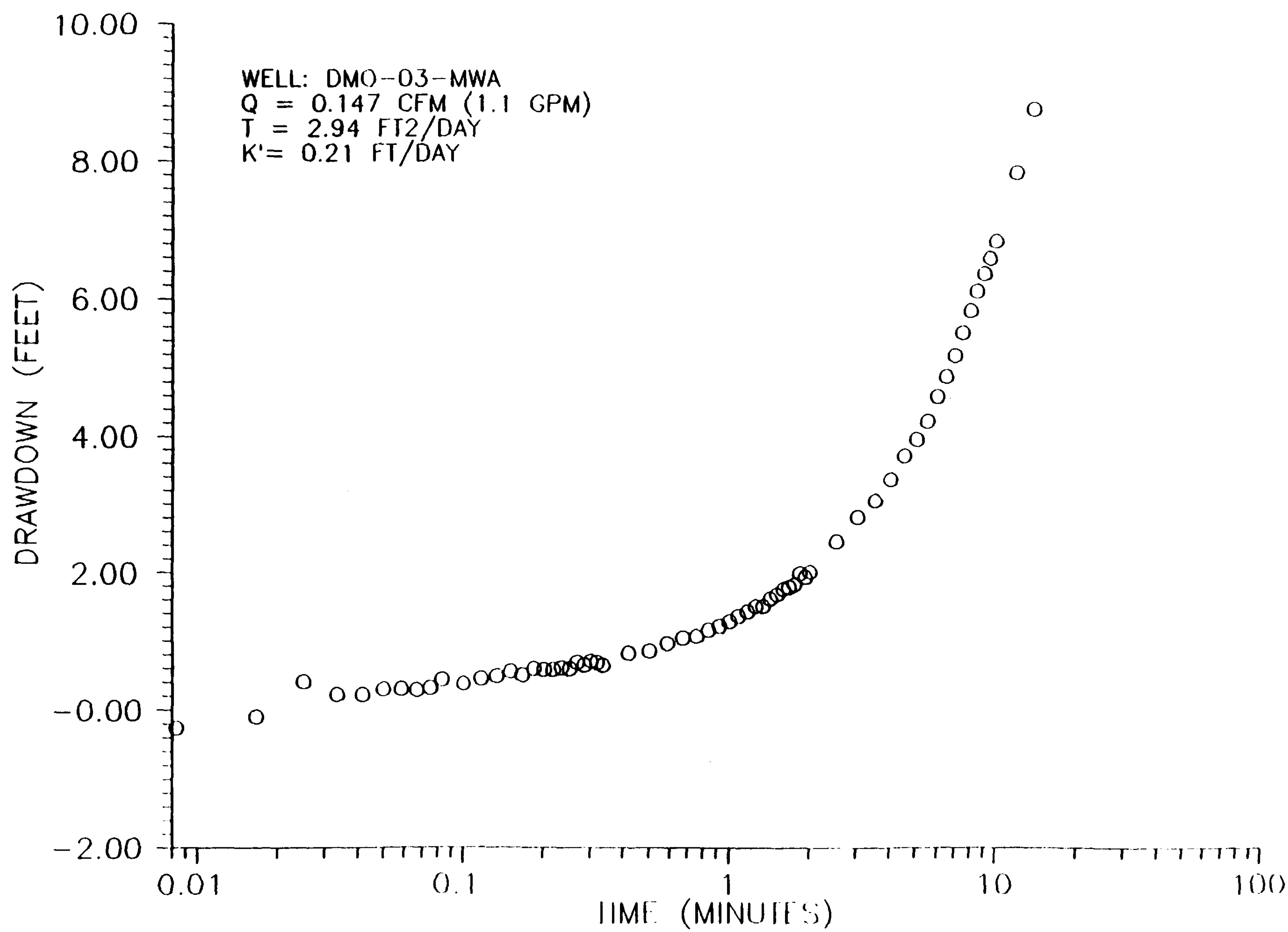

WELL: TNT16MWA(RECOVERY)
Q = 0.535 CFM (4.0 GPM)
RECOVERY STARTED AT 28.4 MINUTES
T = 17.2 FT2/DAY
K' = 1.2 FT/DAY
DRAWDOWN (FEET)
10.00
6.00
2.00
-2.00
1
10
100
1000
TIME (MINUTES)


WELL: TNT-16-MWA
Q = 0.535 CFM (4.0 GPM)
T = 27.6 FT2/DAY
K'= 2.0 FT/DAY
DRAWDOWN (FEET)
10.00
8.00
6.00
4.00
2.00
0.00
0.01
0.1
1
10
100
TIME (MINUTES)

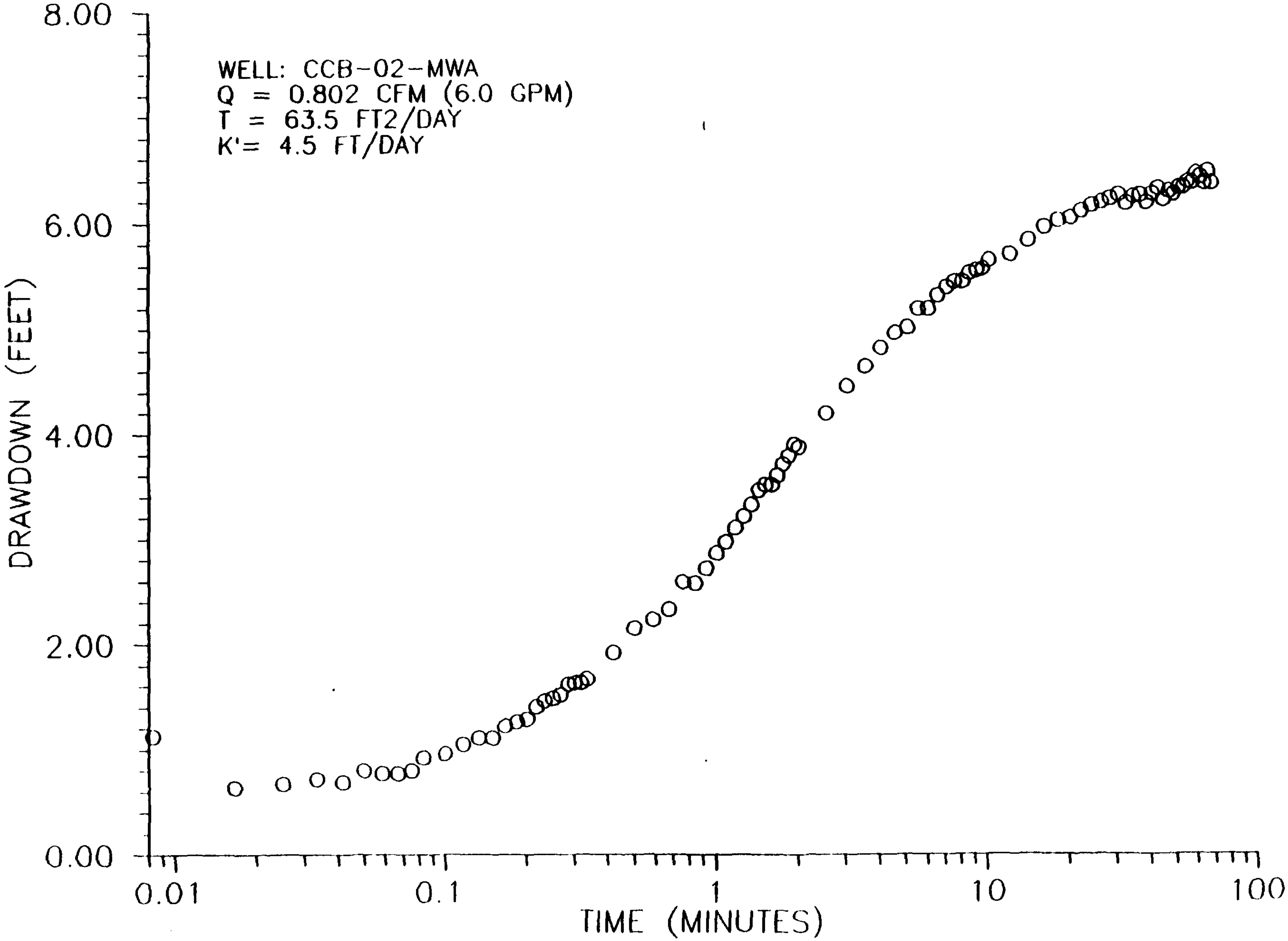

WELL: DMO-04-MWA RECOVERY (START AT 81.57 MIN.)
Q = 0.374 CFM (2.8 GPM)
T = 10.9 FT2/DAY
K'= 0.78 FT/DAY
7.25
ΔS= 9.05 FT
-1.80
DRAWDOWN (FEET)
10.00
6.00
2.00
-2.00
1
10
100
1000
10000
TIME (MINUTES)


WELL: DMO-04-MWA
Q = 0.374 CFM (2.8 GPM)
T1= 36.9 FT2/DAY
T2= 22.9 FT2/DAY
K'= 1.6 FT/DAY
DRAWDOWN (FEET)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.01
0.1
1
10
100
TIME (MINUTES)

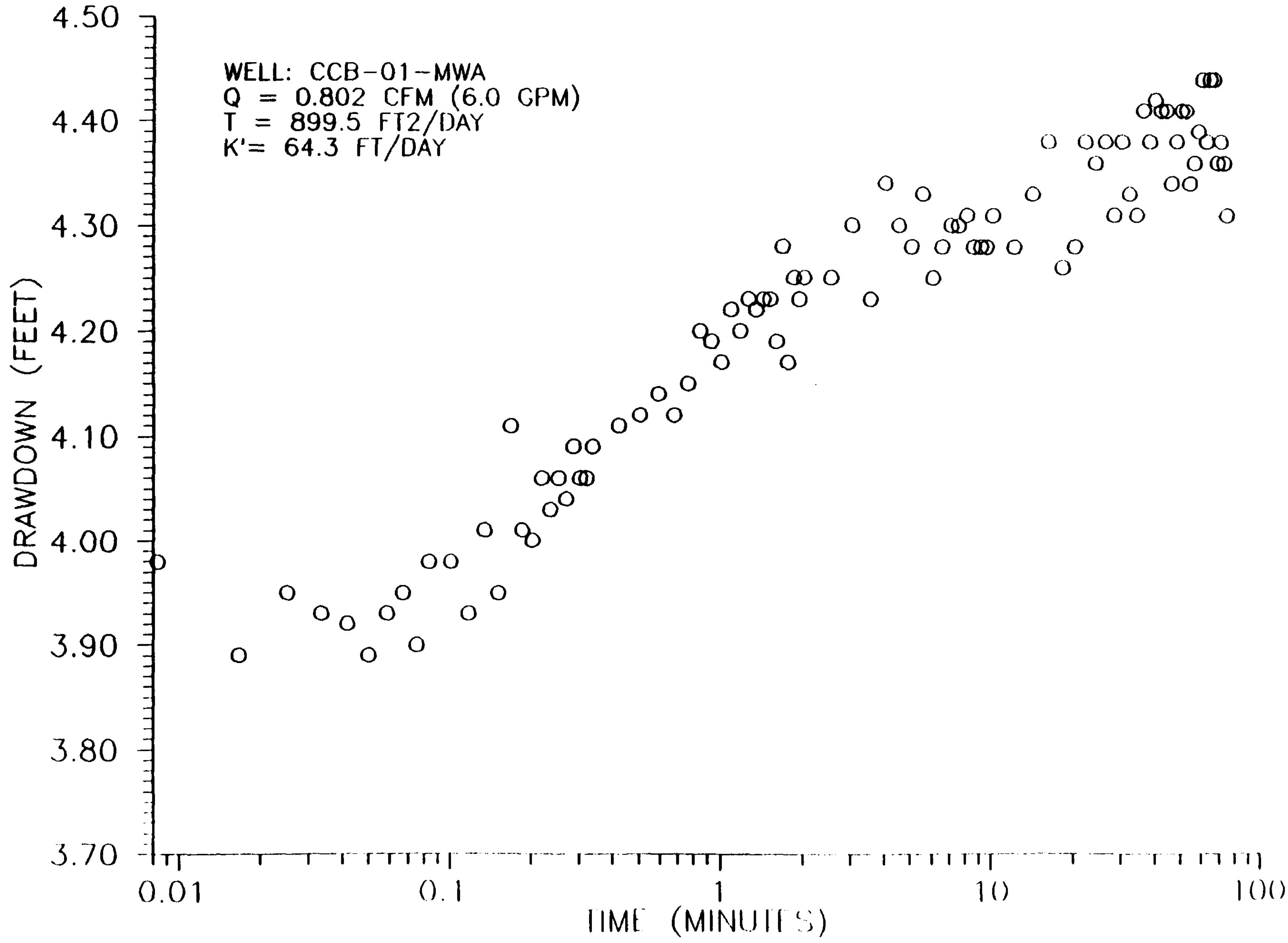

WELL: DMO-03-MWA RECOVERY (START AT 14.88 MIN.)
Q = 0.147 CFM (1.1 GPM)
T = 2.94 FT2/DAY
K'= 0.21 FT/DAY
DRAWDOWN (FEET)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
−2.00
1
10
100
1000
10000
TIME (MINUTES)



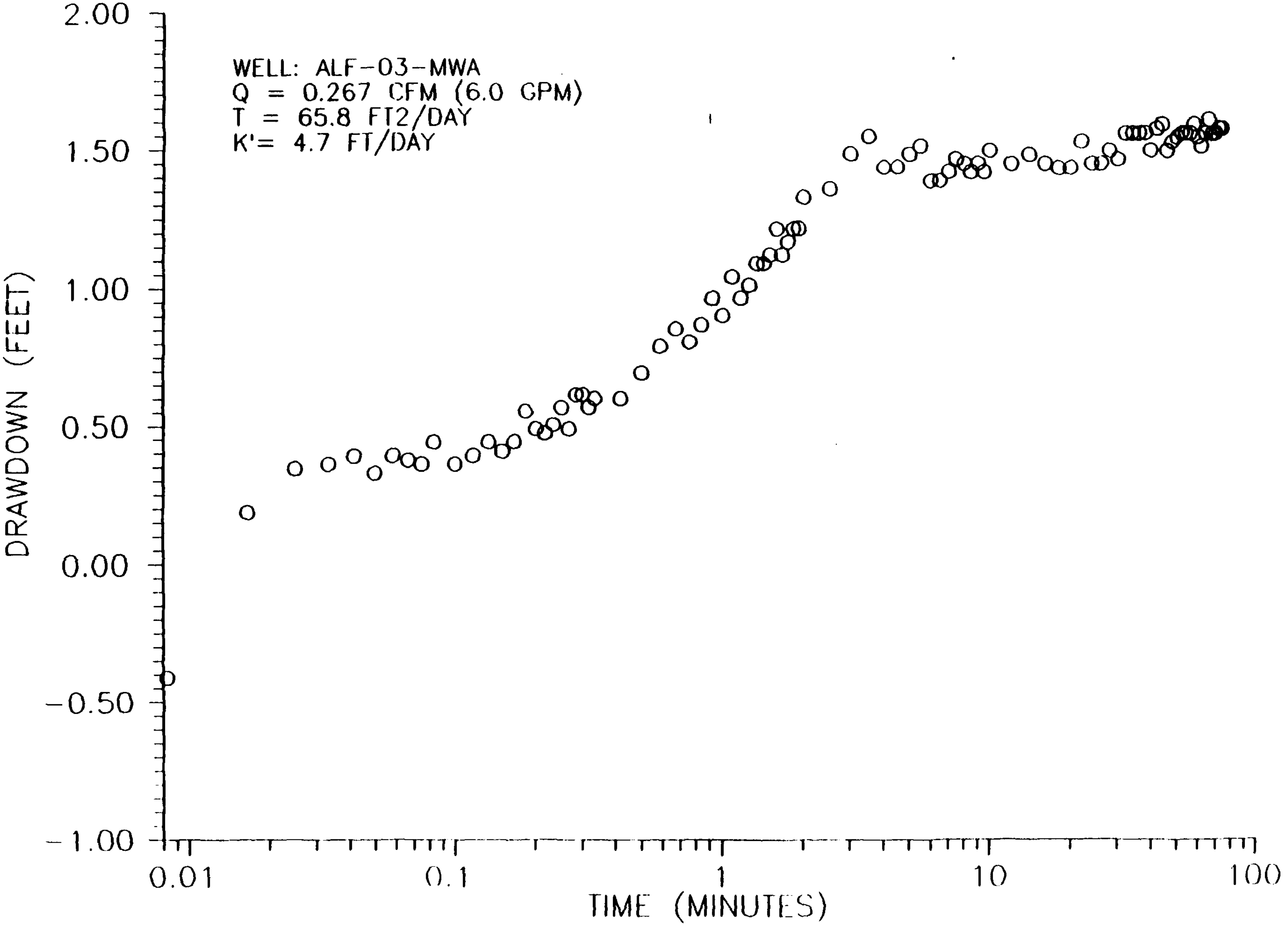
WELL: DMO-03-MWA
Q = 0.147 CFM (1.1 GPM)
T = 2.94 FT2/DAY
K'= 0.21 FT/DAY
DRAWDOWN (FEET)
10.00
8.00
6.00
4.00
2.00
-0.00
-2.00
0.01
0.1
1
10
100
TIME (MINUTES)



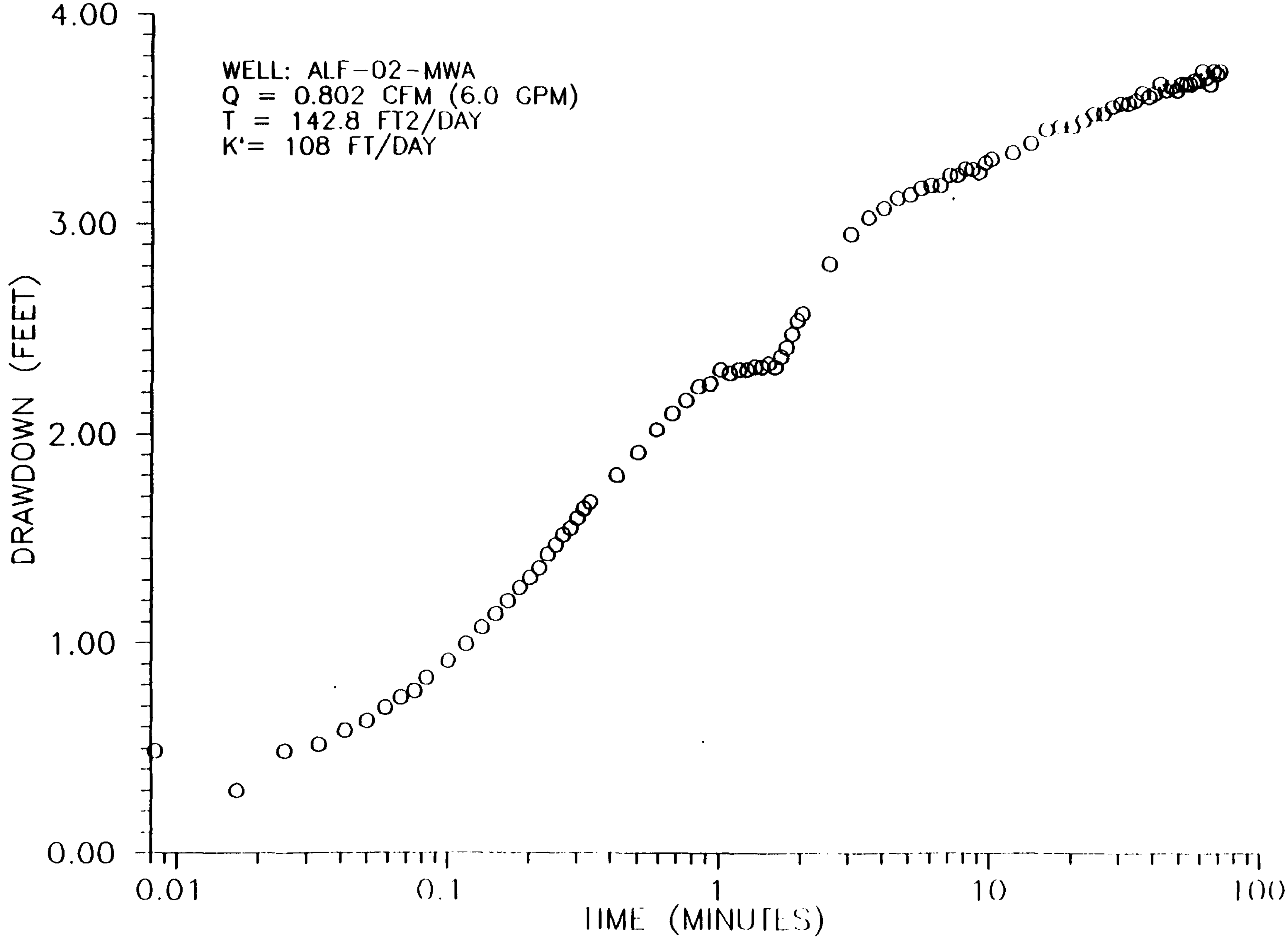
WELL: CCB-02-MWA
Q = 0.802 CFM (6.0 GPM)
T = 63.5 FT2/DAY
K'= 4.5 FT/DAY
DRAWDOWN (FEET)
8.00
6.00
4.00
2.00
0.00
0.01
0.1
1
10
100
TIME (MINUTES)



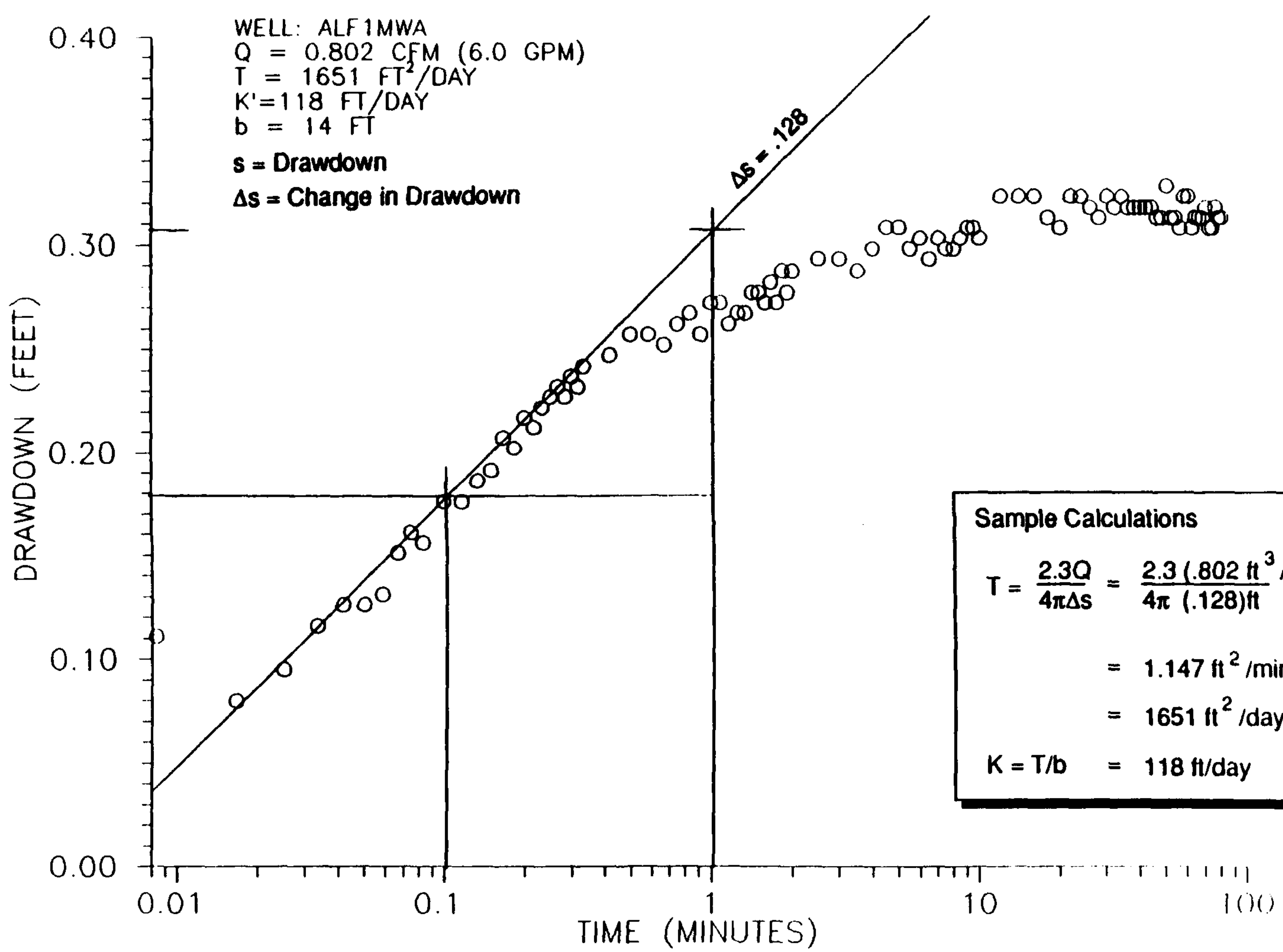
WELL: CCB-01-MWA
Q = 0.802 CFM (6.0 GPM)
T = 899.5 FT2/DAY
K'= 64.3 FT/DAY
DRAWDOWN (FEET)
4.50
4.40
4.30
4.20
4.10
4.00
3.90
3.80
3.70
0.01
0.1
1
10
100
TIME (MINUTES)



WELL: ALF-03-MWA
Q = 0.267 CFM (6.0 GPM)
T = 65.8 FT2/DAY
K'= 4.7 FT/DAY
DRAWDOWN (FEET)
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
0.01
0.1
1
10
100
TIME (MINUTES)



WELL: ALF-02-MWA
Q = 0.802 CFM (6.0 GPM)
T = 142.8 FT2/DAY
K'= 108 FT/DAY
DRAWDOWN (FEET)
4.00
3.00
2.00
1.00
0.00
0.01
0.1
1
10
100
TIME (MINUTES)



Sample Calculations

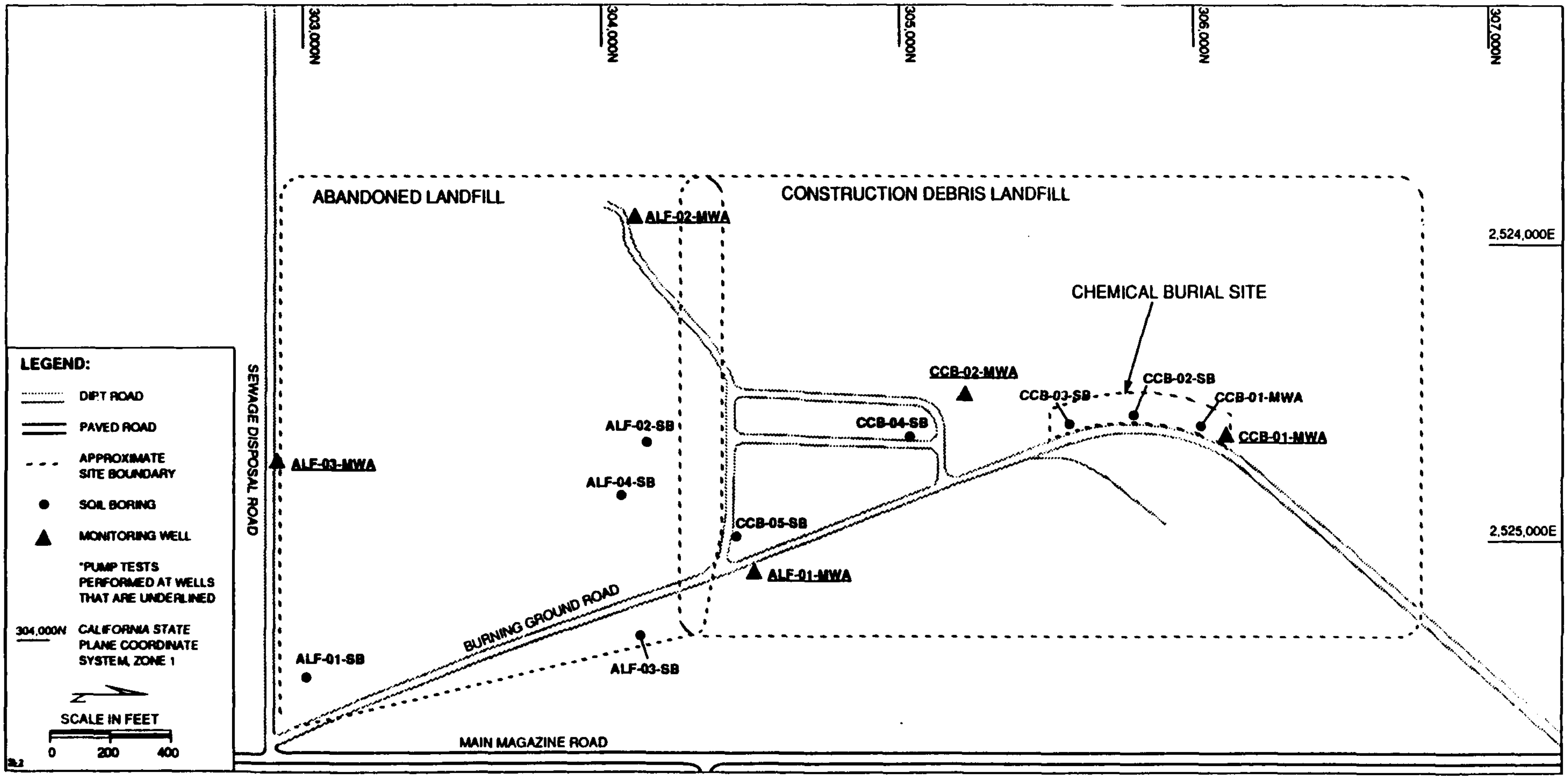
$$T = \frac{2.3Q}{4\pi\Delta s} = \frac{2.3\,(.802\ \text{ft}^3/\text{m})}{4\pi\ (.128)\text{ft}}$$

$$= 1.147\ \text{ft}^2/\text{min}$$

$$= 1651\ \text{ft}^2/\text{day}$$

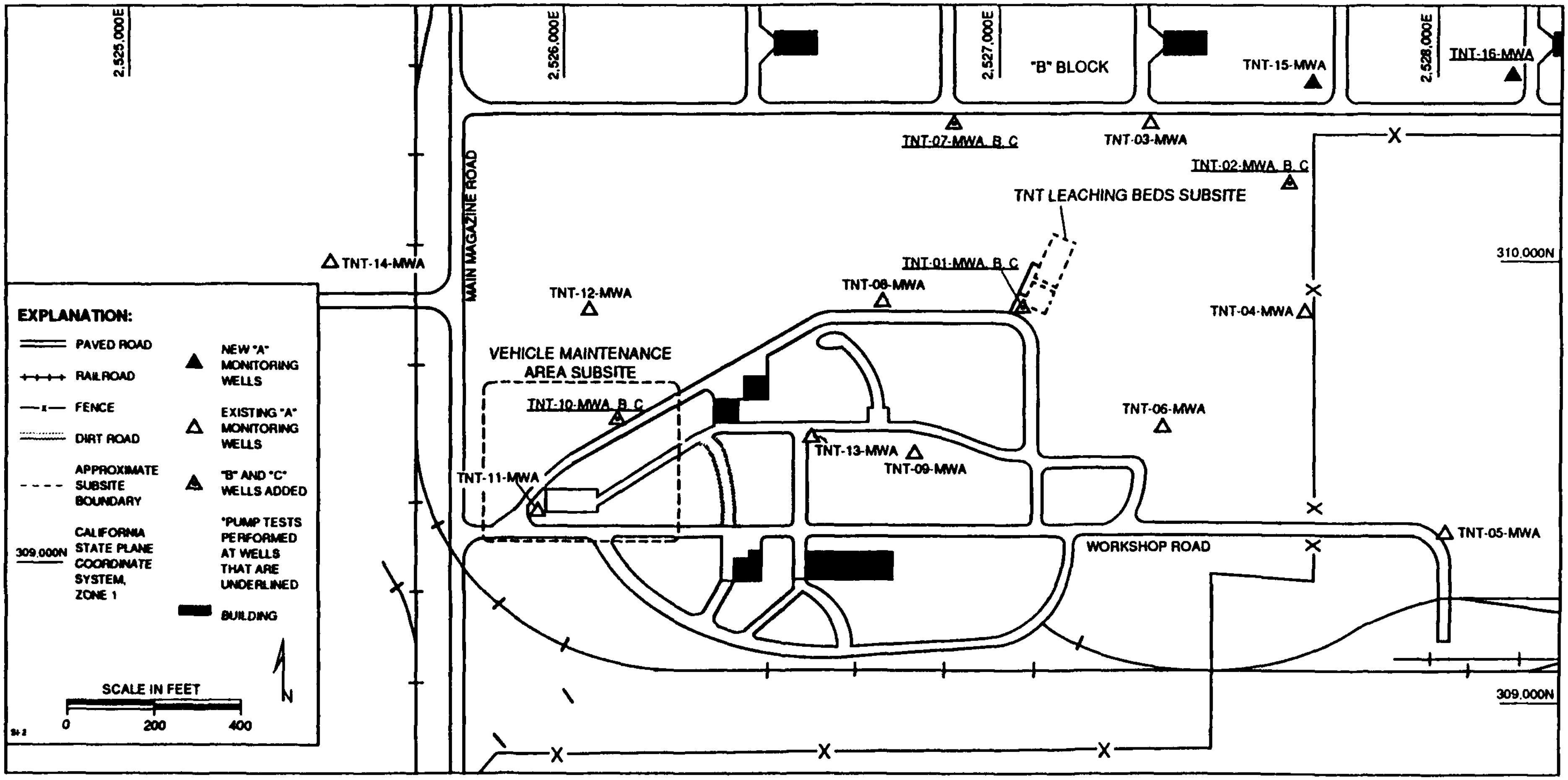
$$K = T/b = 118\ \text{ft/day}$$

SIERRA ARMY DEPOT
DRAWDOWN CURVE



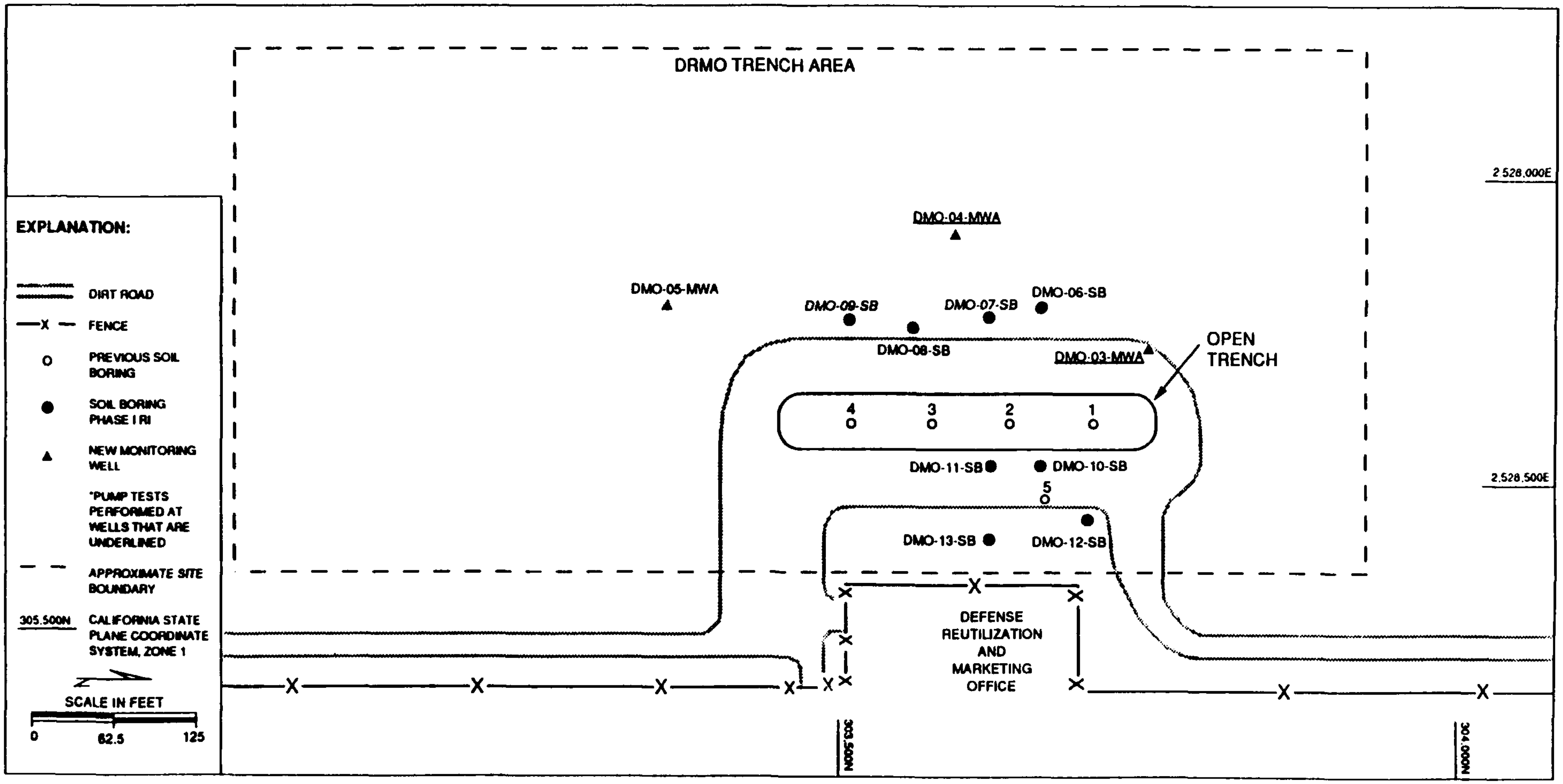
SIERRA ARMY DEPOT
MONITORING WELL & SOIL BORING LOCATIONS:
ABANDONED LANDFILL/CHEMICAL BURIAL SITE/CONSTRUCTION DEBRIS LANDFILL

FIGURE L-1



SIERRA ARMY DEPOT
MONITORING WELLS:
TNT LEACHING BEDS AREA

FIGURE L-2



SIERRA ARMY DEPOT
MONITORING WELL AND SOIL BORING LOCATIONS:
DRMO TRENCH AREA

FIGURE L-3

APPENDIX K
BASIN-WIDE FLOW MODEL AT HONEY LAKE VALLEY

K.1 Introduction

A three-dimensional finite-difference code, commonly referred to as the U.S. Geological Survey (USGS) modular flow model, or MODFLOW, was used to simulate current and future groundwater conditions in Honey Lake Basin. Primary objectives of the basin-wide groundwater flow model included:

- Gaining a better understanding of the regional hydrogeologic framework.
- Determination of boundary conditions and delineation of flow fields for site-specific solute transport models.
- Evaluation of potential impacts due to increasing groundwater development within Honey Lake Basin.
- Evaluation of potential impacts to water supply wells due to different remedial alternatives.
- Assessing the implications of pump-and-treat alternatives on safe yield of the aquifer and water levels of Honey Lake.

K.2 MODFLOW Overview

Finite-difference models have been used extensively by the USGS and others in recent years to simulate groundwater flow. Among these computer codes, MODFLOW is highly regarded because of its flexibility, portability, and numerous options which allow simulation of the effects of wells, drains, recharge, evapotranspiration, rivers, and general-head (variable-head) boundaries.

Flexibility of the model derives from a design in which the main program has been separated from a series of independent subroutines or modules. MODFLOW can use either the Strongly Implicit Procedure (SIP), or the Slice-Successive Overrelaxation

method (SSOR) as solution techniques. McDonald and Harbaugh (1988) describe the model development, numerical solutions, module documentation, and computer code in detail.

K.3 Model Setup

An investigation of the groundwater resources of Honey Lake Valley by the USGS (Handman, et al, 1990) and the Northeastern Counties Groundwater Investigation (California Department of Water Resources, 1963a,b) were important references for the development of this model.

The USGS modeled subsurface flow in the Honey Lake area primarily to assess the impact of increasing groundwater development within the basin and, specifically, a proposed pumping increase of 15,000 acre-feet/year to supply the Reno-Sparks area in western Nevada (Handman, et al, 1990). Important differences between the JMM model and the USGS model include:

- The JMM model has a variable mesh grid with cells as small as 1,000 by 1,000 feet in the SIAD area. The USGS model has a constant grid size (1 square mile).
- The JMM model looks at the shallow aquifer system, to a depth of only about 600 feet below the water table. The USGS modeled entire saturated thickness within the basin with model layers extending to depths of more than 5,000 feet in places.
- The JMM model extends farther west than the USGS model to encompass the Sierra Army Depot and portions of Honey Lake and Long Valley Creek.

The USGS model used the 1988-1989 water year for steady-state calibration. Input parameters of this model were thus taken from 1989, and the steady-state calibration was made against the piezometric surface simulated by the USGS model.

An aquifer system must be spatially discretized to be represented in a finite-difference

model. This is accomplished by dividing it vertically into layers, and horizontally into a rectangular grid composed of rows and columns. Each resulting cell represents a three-dimensional block within the aquifer. A dimensionless node at the center of each cell represents the average value of each aquifer parameter being taken into account within the cell (i.e., head, recharge, hydraulic conductivity).

Model Grid and Layers

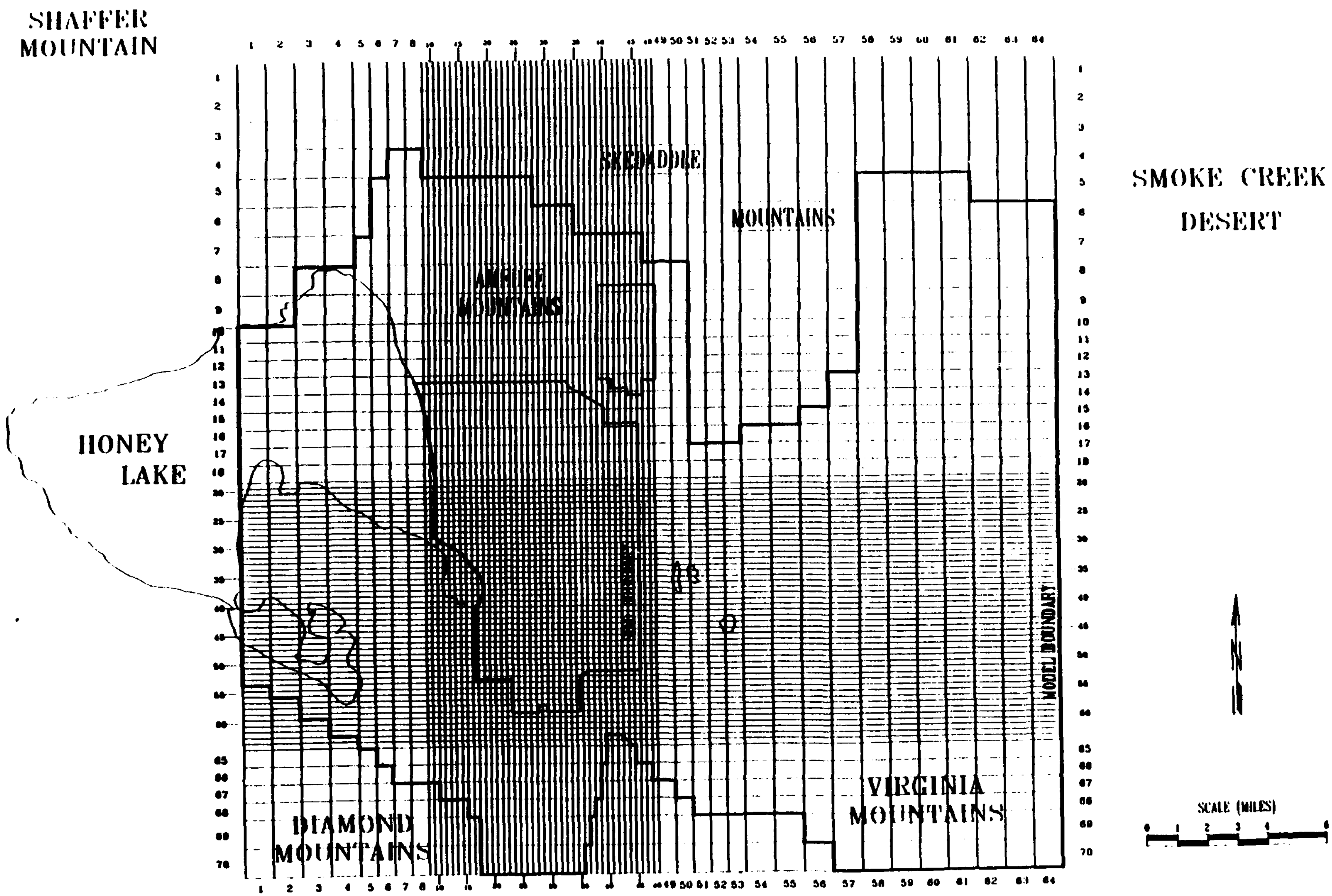
A 64 by 70 node grid with four layers was used to model Honey Lake Basin. A finer mesh was used in the vicinity of the Sierra Army Depot (1,000 by 1,000 feet), and a coarser mesh towards the outer boundaries of the model (up to 5,000 by 5,000 feet). Total area of the model was approximately 488 square miles (Figure K-1). Areas outside the model boundary in Figure K-1 are inactive cells, although data for model input was gathered from these areas.

Layer thicknesses for the model were assigned on the basis of two primary considerations: 1) evaluation of potential impacts of remedial actions to the Herlong production wells, and 2) *site-specific characterization* of groundwater flow. Figure K-2 is a cross section through the four Herlong production wells. Layers were assigned to correspond with production zones in these wells. These intervals were considered likely pathways for any potential solute migration into the wells. Layer 1 was given a thickness of 50 feet starting at the phreatic water surface. Layers 2, 3, and 4 were assigned thicknesses of 80, 150, and 300 feet, respectively.

The water table was simulated as a free-surface boundary whose elevation could respond vertically to changes in flux. Initial head values for the model were taken from the USGS simulation (Handman, et al, 1990) and from wells at the Sierra Army Depot and other locations in Honey Lake Valley.

Model Boundaries

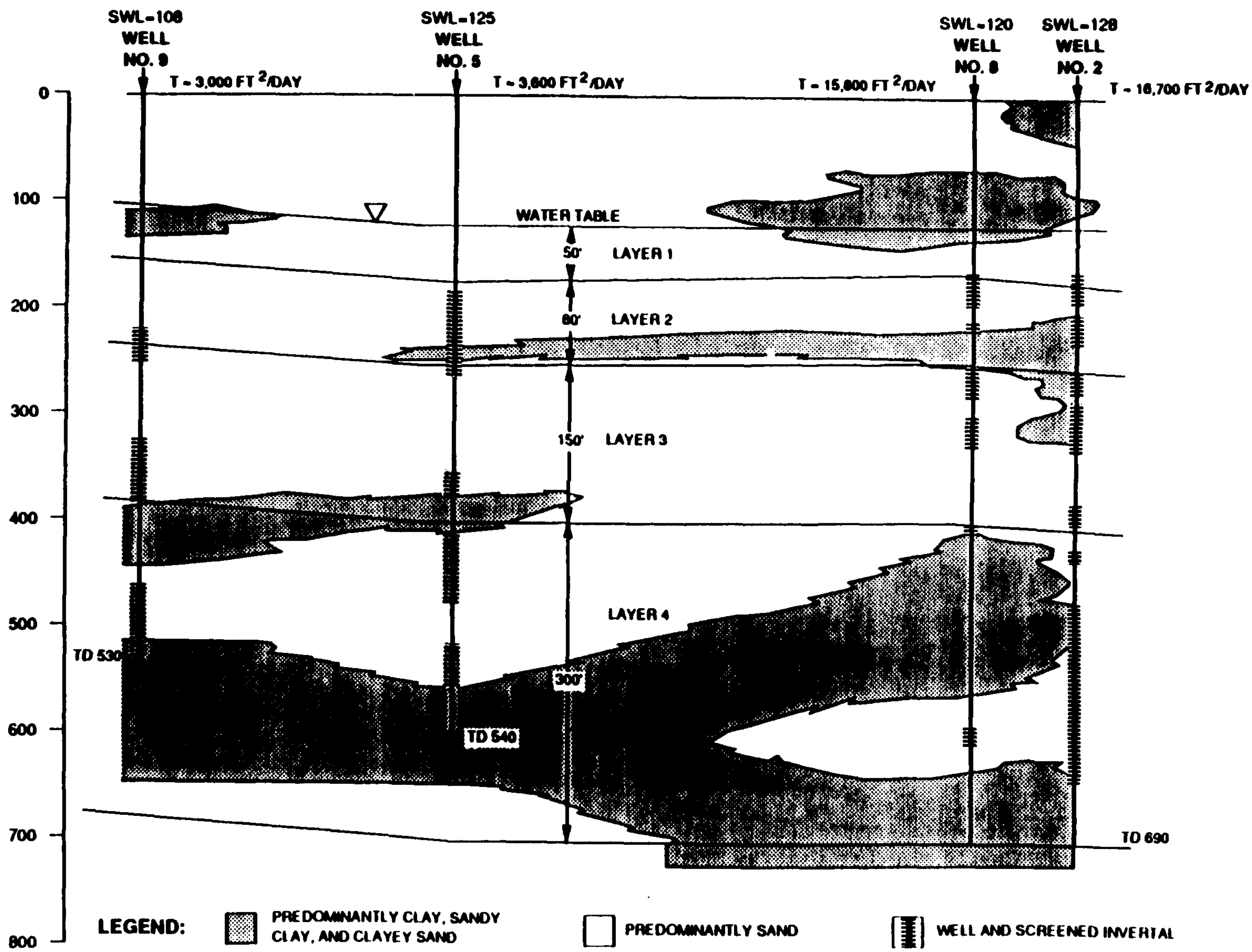
Model boundaries are delineated in Figure K-3. A no-flow boundary was assigned in the northwestern portion of the model boundary where groundwater flow parallel to the boundary indicates the absence of flux across it (boundary 1 in Figure K-3). The granitic



USATHAMA
REMEDIAL INVESTIGATIONS
SIERRA ARMY DEPOT

FIGURE K-1: MODEL GRID AND BOUNDARY
HONEY LAKE VALLEY, CALIFORNIA

PREPARED BY
JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

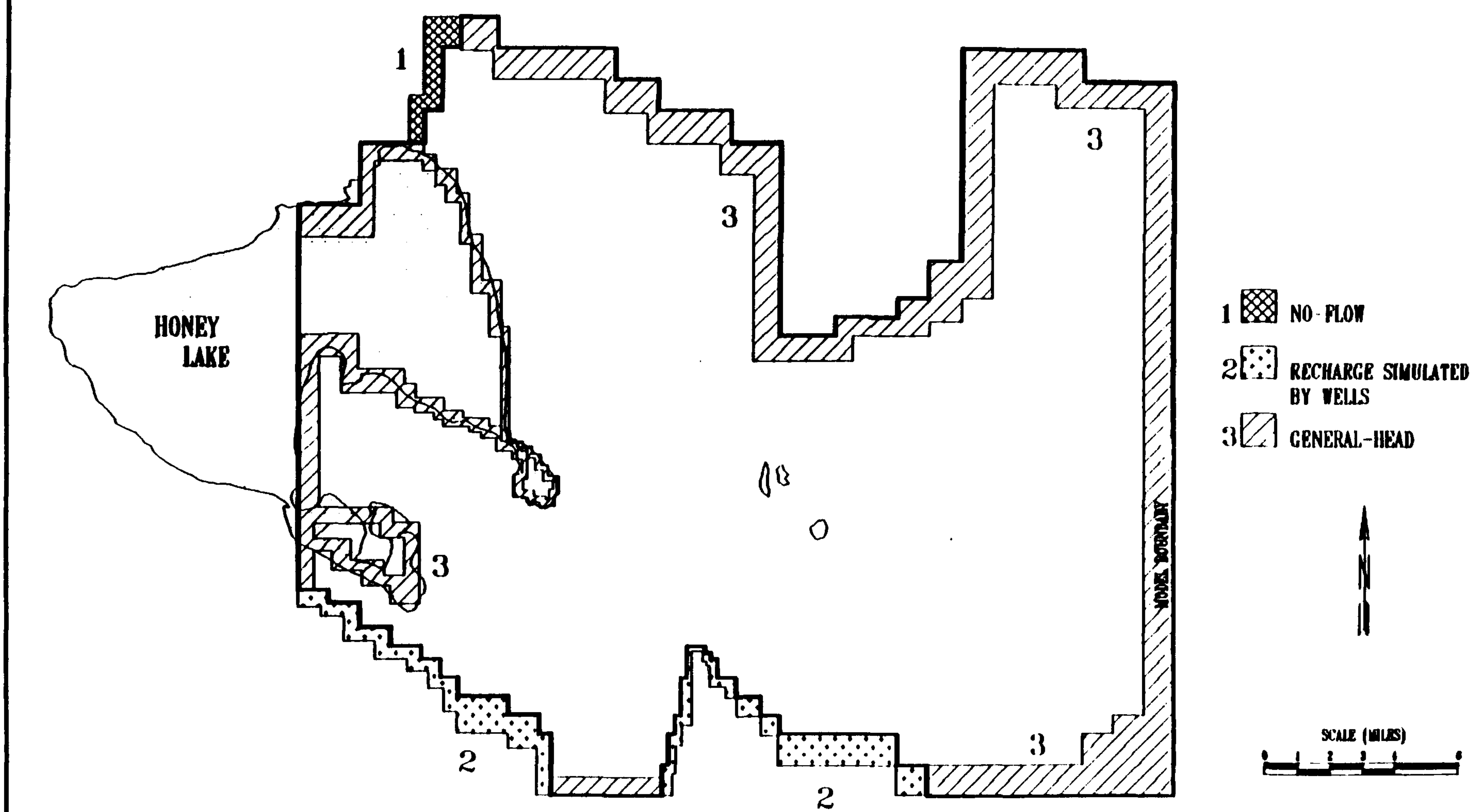


SIERRA ARMY DEPOT

GEOLOGIC CROSS SECTION THROUGH POTABLE SUPPLY WELLS 2, 5, 8, AND 9

SHOWING SCREENED WELL INTERVALS & MODEL LAYERS

FIGURE K-2



USATHAMA
REMEDIAL INVESTIGATIONS
SIERRA ARMY DEPOT

FIGURE K-3: BOUNDARY CONDITIONS FOR MODEL

PREPARED BY
JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

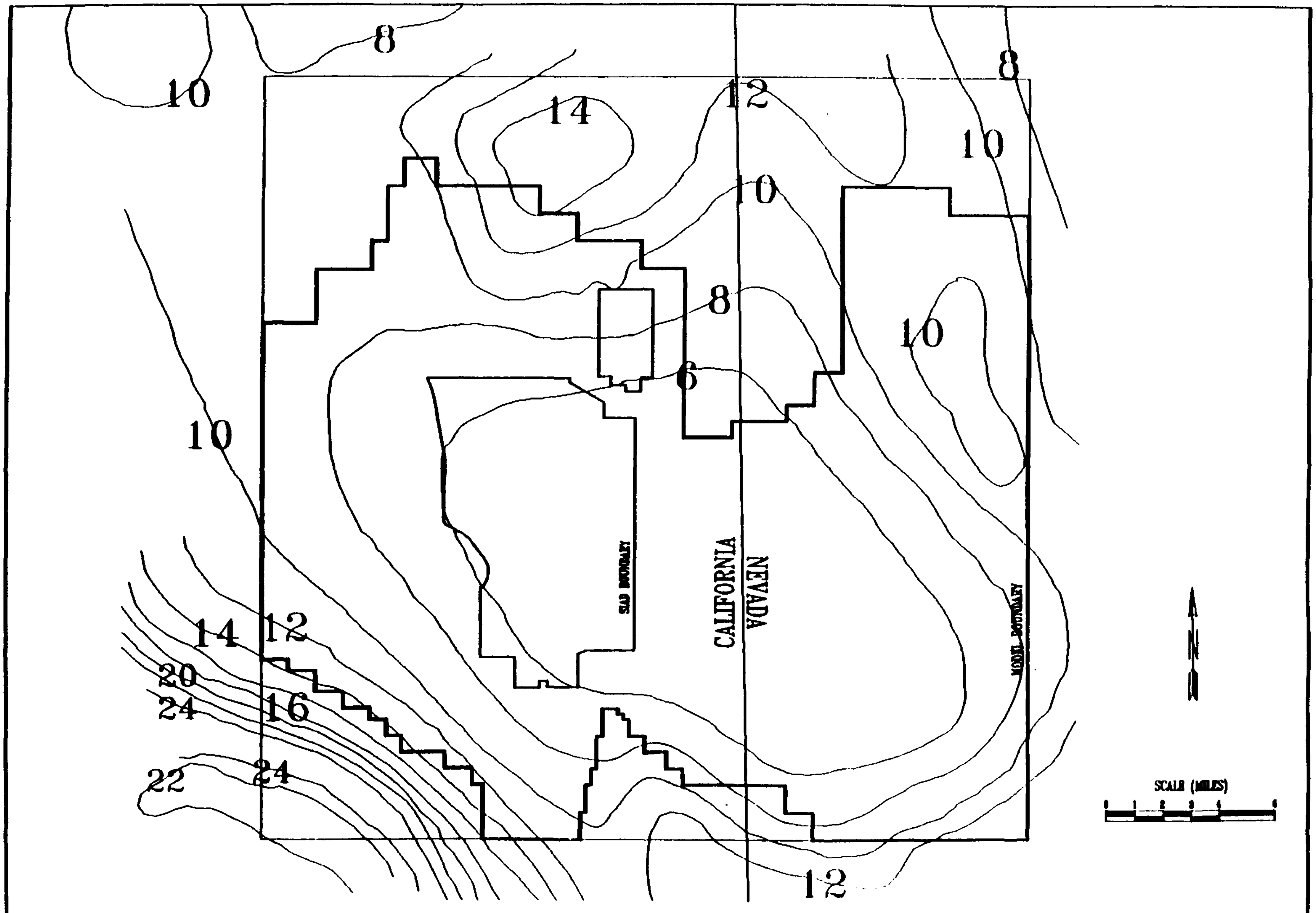
Diamond and Fort Sage mountains in the southwest and south-central model areas were also simulated as no-flow boundaries, however, recharge from these mountains was accounted for by simulating injection wells at localities where stream runoff should provide aquifer recharge (boundary 2). This recharge was varied during the transient model calibration to account for seasonal variations.

All other model boundaries were designated as general-head boundaries in which hydraulic head could vary as a result of flow in or out of the cell (boundary 3). These boundaries were placed at the margins of the basin where data was insufficient to accurately define model fluxes, and far enough from areas of interest in the central portion of the basin so as not erroneously influence model calibration.

Simulated Recharge

Recharge in Honey Lake Basin (other than granitic mountains) was simulated in the model by converting a portion of annual precipitation into an average recharge flux to the groundwater. Precipitation contours were taken from mean seasonal values (California Department of Water Resources, 1963b) and adjusted for 1989 values at several gauging stations. Figure K-4 shows 1989 precipitation in the model area. Three to four percent of total precipitation was found to approximate aquifer recharge during model calibration. Because of high evapotranspiration and low permeabilities within the basin, model areas with less than 7 inches of annual precipitation (most of the central Honey Lake Basin) were given zero recharge. Evapotranspiration was assumed to be accounted for in all recharge values.

The total thickness of all model layers (580 feet) was only about 10 percent of the total saturated sediment thickness in the northern part of the basin (>5,000 feet). Recharge to basin sediments from the northern volcanics aquifer must occur throughout this 5,000 foot plus interval and, therefore, only some fraction of recharge from the northern volcanics area would directly recharge the model layers. Simulated recharge from this area was reduced to compensate for this discrepancy. Recharge from agricultural irrigation was not considered separately.



USATHAMA
REMEDIAL INVESTIGATIONS
SIERRA ARMY DEPOT

FIGURE K-4: 1989 PRECIPITATION IN MODEL AREA (INCHES)

PREPARED BY
JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

Wells

Locations of the four active production wells at Herlong appear in Figure K-5. Production from these wells in 1989 was estimated from pumping records and is shown in Table K-1. Total well production at Herlong was approximately 750 acre-feet in 1989. This data was input into the model as average rates of discharge for the steady-state model calibration. For the transient calibration well discharge was simulated for the stress periods during which it occurred.

Groundwater discharge from five deep agricultural supply wells located in the southeast quadrant of the model, near the Fish Springs Ranch area in Nevada, were simulated in model cells of layer 4 corresponding to the locations of these wells. Total simulated groundwater withdrawal was about 5,900 acre-feet based on the estimate used by the USGS (Handman, et al, 1990).

Aquifer Properties

The USGS model had hydraulic conductivity inputs ranging from 0.01 to 45 feet/day, with conductivity decreasing at depth in basin-fill deposits. These values were taken as starting points for calibration of this model, however, since the JMM model layer thicknesses were much less than those in the USGS model, reduction in permeability with depth was considered negligible. Transmissivities for areas west of the USGS model were estimated from pump tests performed on several wells at Sierra Army Depot, and from specific capacities of a small number of wells outside the base. The basin-fill deposits were found to be extremely heterogenous on a large-scale, both vertically and laterally, with conductivities varying by several orders of magnitude over small intervals. The prevalence of sandy lenses separated by more silty/clayey layers was probably responsible for this extreme aquifer heterogeneity.

Specific capacities for Herlong wells (U.S. Army Corps of Engineers, 1961, 1964; and Walters, et al, 1969) were used to estimate aquifer transmissivities using the method described by Driscoll (1986). Transmissivity estimates were 16,700 ft^2/day, 3,600 ft^2/day, 15,800 ft^2/day, and 3,000 ft^2/day for wells 2,5,8, and 9, respectively. Calculations of aquifer tranmissivity based on estimated thickness of saturated permeable zones within

TABLE K-1

1989 PRODUCTION DATA FOR HERLONG WELLS
(TOTAL MONTHLY PUMPAGE IN CUBIC FEET)

Month	Well 2	Well 5	Well 8	Well 9
April	80,200	1,550,000	2,206,000	361,000
May	134	4,117,000	1,163,000	1,990,000
June			989,000	0
July	1,230,00	3,877,000	0	1,200,000
August	2,300,000	361,000	267,000	0
September	401,000	294,000	107,000	0
October	0	2,740,000	1,056,000	0
November	44,700	2,780,000	13,400	2,607,000
December	0	0	922,000	0
Total	**4,056,034**	**15,719,000**	**6,723,400**	**6,158,000**

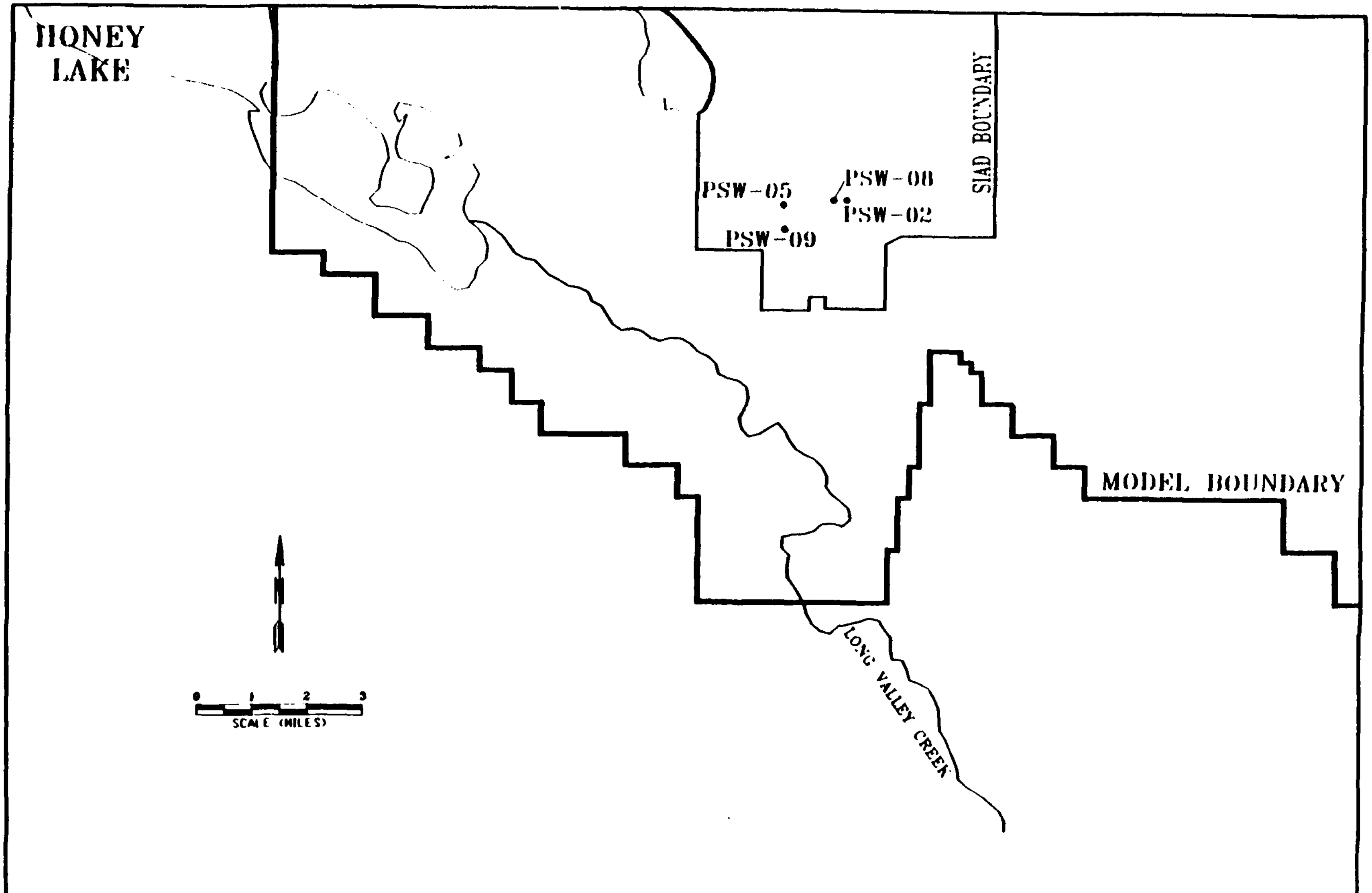


FIGURE K-5: LOCATION OF HERLONG PRODUCTION WELLS IN SIERRA ARMY DEPOT

the well intervals appear below.

ESTIMATES OF HYDRAULIC CONDUCTIVITY AROUND HERLONG WELLS

WELL	2	5	8	9
b(ft)	320	400	285	400
K(ft/day)	52.0	9.0	55.4	7.5

b= saturated aquifer thickness
K= hydraulic conductivity

Aquifer parameters which were specified for each cell in the model included horizontal and vertical hydraulic conductivity, and leakage between layers. Zones of similar aquifer materials for layer 1 appear in Figure K-6. Their respective conductivity values are shown below. Vertical conductivities, which directly relate to vertical leakage between model layers of differing heads, were given a typical estimate of about 1/100 of horizontal conductivity (Freeze and Cherry, 1979).

Hydraulic Conductivities Used in Model

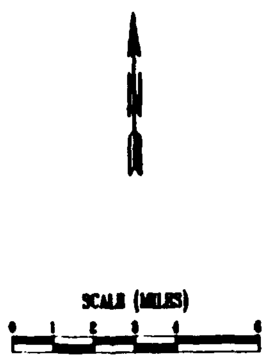
Model Area	K (ft/day)
1. Granitics (Diamond and Fort Sage Mountains)	Inactive Nodes
2. Fault Zone	0.3-0.4
3. Northern Volcanics (Amedee, Skedaddle Mountains)	2-5
4. Central Basin-Fill Deposits	1-4
5. Perimeter Basin-Fill Deposits	4-6
6. Southern Volcanics (Virginia Mountains)	10-45
7. Fluvial Deposits (Long Valley Creek)	10-50
8. Lacustrine (Honey Lake) Deposits	1-3

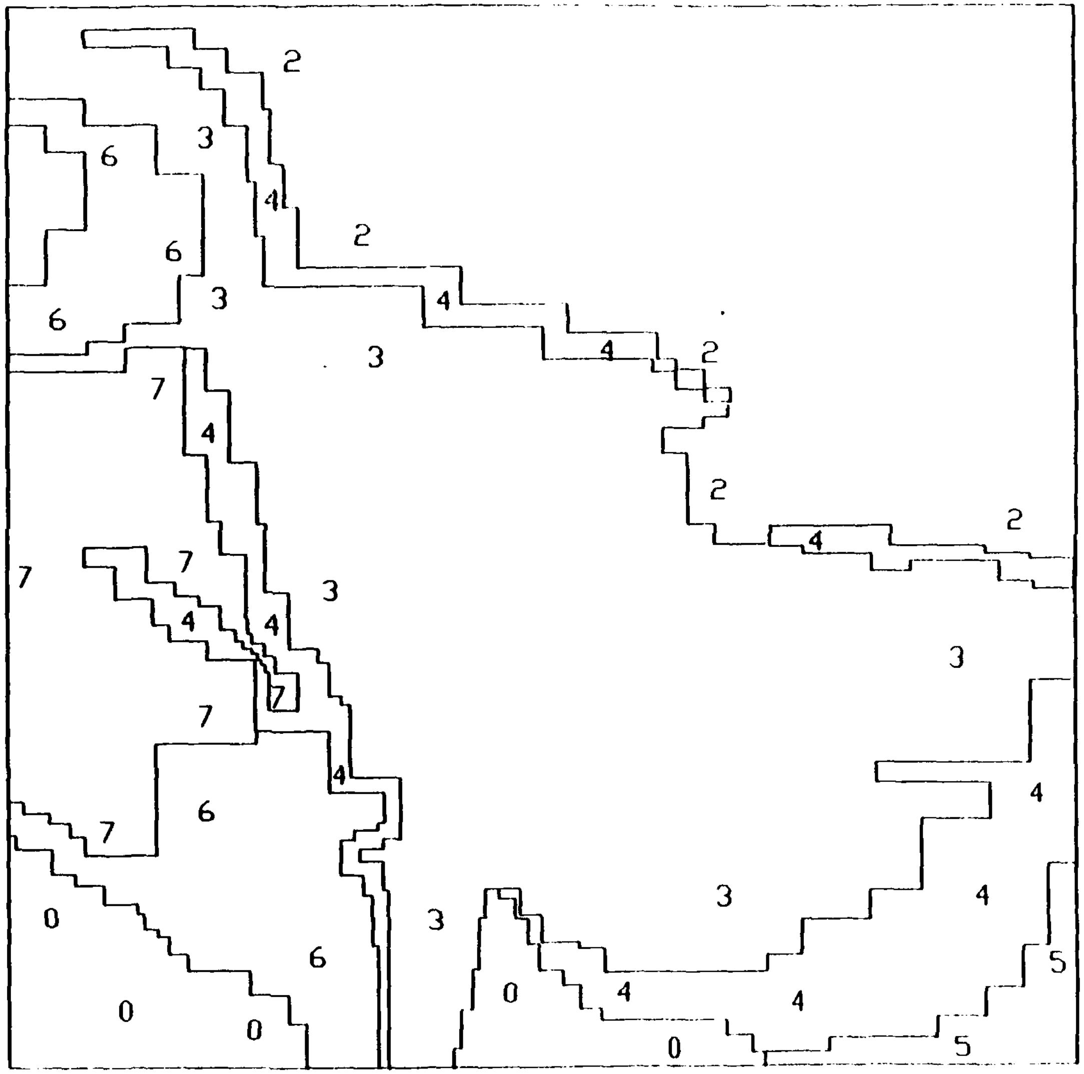
River Recharge

Long Valley Creek transects the southwestern corner of the model area. River recharge was simulated with wells in the same way that recharge from southern granitic mountains was simulated, because available data was considered insufficient to properly define parameters for the MODFLOW river package. Streamflow in 1988 for Long Valley

EXPLANATION:

0: INACTIVE CELLS
1: FAULT ZONE
2: NORTHERN VOLCANICS
3: CENTRAL BASIN-FILL DEPOSITS
4: BASIN PERIMETER DEPOSITS
5: BASIN-FILL AND SOUTHERN VOLCANICS
6: FLUVIAL DEPOSITS
7: LACUSTRINE (HONEY LAKE) DEPOSITS





USATHAMA REMEDIAL INVESTIGATIONS SIERRA ARMY DEPOT	FIGURE K-6: ZONES OF HYDRAULIC CONDUCTIVITY USED IN BASIN-WIDE MODEL	PREPARED BY JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.

Creek was estimated as 17,000 acre-feet near Doyle (Handman, et al. .990). A recharge value of 1,500-2,000 acre-feet/yr from Long Valley Creek was found to produce water levels in that area consistent with assumed steady-state conditions. Recharge was varied seasonally during transient model calibration. Flux from Long Valley Creek was considered the major source of recharge to the production wells at Herlong.

K.4 Steady-State Model Calibration

The model was calibrated against 12 wells located throughout the central basin area (Figure K-7), and compared with the simulated piezometric surface generated by the USGS model. Various model parameters, primarily general-head boundaries and hydraulic conductivities, were varied until a reasonable match (within 5 feet in the west-central basin, within 10 feet elsewhere) was produced between average well levels measured during the two-year period between April 1987 and March 1990, and corresponding simulated head values (Table K-2).

Figure K-8 shows simulated steady-state water level contours for layer 1. Matches with USGS contours were less precise in the northern and southern mountain areas (wells 9 and 12) because of inadequate data in these areas. Well discharge and aquifer discharge is simulated in the model over the area of the entire cell and will generally not correspond closely with water levels at a single point, such as a well, in areas with significant changes in hydraulic head. Mountainous areas generally exhibit large variations in head and aquifer parameters and were not areas of interest in this study. The focus of model calibration was around SIAD where solute-transport model sites exist.

Wells in the eastern model area were influenced by the agricultural pumping in the basin. Correlation between simulated and measured levels in these wells is strongly dependent on the time and accuracy with which these measurements were taken, and the accuracy of well discharge records. Some well monitoring data which had to be discarded indicated drawdowns of approximately 20 feet in some of these wells, although water levels were apparently very stable during continuous pumping. Well 3 is a pumped well

TABLE K-2

COMPARISON BETWEEN SIMULATED AND MEASURED WATER LEVELS IN STEADY-STATE MODEL (FEET)

Layer 1		Sim.	Meas.	Diff.
Head at Well Number 1	=	3971.4	3971.9	-.5
Head at Well Number 2	=	3966.7	3966.4	.3
Head at Well Number 3	=	3973.2	3971.0	2.2
Head at Well Number 4	=	3965.8	3957.0	8.7
Head at Well Number 5	=	3983.6	3985.1	-1.5
Head at Well Number 6	=	3985.2	3984.0	1.2
Head at Well Number 7	=	3985.1	3975.0	.1
Head at Well Number 8	=	3978.7	3980.4	-1.7
Head at Well Number 9	=	3969.1	3963.0	6.1
Head at Well Number 10	=	3963.9	3960.6	3.3
Head at Well Number 11	=	3957.8	3964.4	-6.6
Head at Well Number 12	=	3988.5	3985.8	2.7

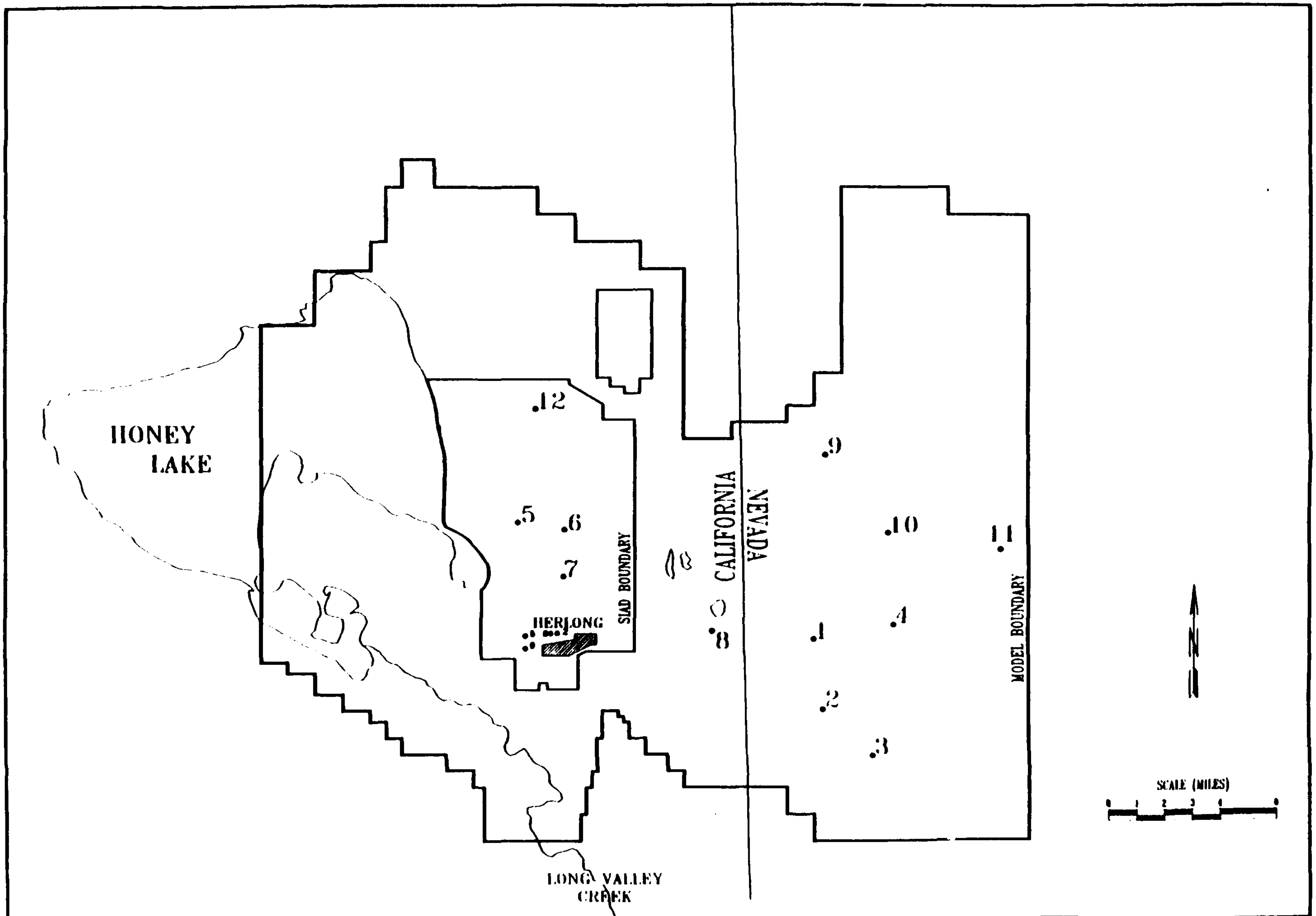
Layer 2		Sim.	Meas.	Diff.
Head at Well Number 1	=	3971.4	3971.9	-.5
Head at Well Number 2	=	3966.7	3966.4	.3
Head at Well Number 3	=	3972.9	3971.0	1.9
Head at Well Number 4	=	3965.8	3957.1	8.7
Head at Well Number 5	=	3983.6	3985.1	-1.5
Head at Well Number 6	=	3985.2	3984.0	1.2
Head at Well Number 7	=	3985.1	3985.0	1
Head at Well Number 8	=	3978.7	3980.4	-1.7
Head at Well Number 9	=	3969.1	3963.0	6.1
Head at Well Number 10	=	3963.9	3960.6	3.3
Head at Well Number 11	=	3957.8	3964.4	-6.6
Head at Well Number 12	=	3988.5	3985.8	2.7

TABLE K-2 (Continued)

COMPARISON BETWEEN SIMULATED AND MEASURED WATER LEVELS IN STEADY-STATE MODEL (FEET)

Layer 3		Sim.	Meas.	Diff.
Head at Well Number 1	=	3971.4	3971.9	-.5
Head at Well Number 2	=	3966.7	3966.4	.3
Head at Well Number 3	=	3972.1	3971.0	1.1
Head at Well Number 4	=	3965.8	3957.1	8.7
Head at Well Number 5	=	3983.5	3985.1	-1.6
Head at Well Number 6	=	3985.2	3984.0	1.2
Head at Well Number 7	=	3985.1	3985.0	.1
Head at Well Number 8	=	3978.7	3980.4	-1.7
Head at Well Number 9	=	3969.1	3963.0	6.1
Head at Well Number 10	=	3963.9	3960.6	3.3
Head at Well Number 11	=	3957.8	3964.4	-6.6
Head at Well Number 12	=	3988.5	3985.8	2.7

Layer 4		Sim.	Meas.	Diff.
Head at Well Number 1	=	3971.4	3971.9	-.5
Head at Well Number 2	=	3966.5	3966.4	.1
Head at Well Number 3	=	3967.3	3971.0	-3.7
Head at Well Number 4	=	3965.8	3957.1	8.7
Head at Well Number 5	=	3983.5	3985.1	-1.6
Head at Well Number 6	=	3985.2	3984.0	1.2
Head at Well Number 7	=	3985.1	3985.0	.1
Head at Well Number 8	=	3978.7	3980.4	-1.7
Head at Well Number 9	=	3969.0	3963.0	6.0
Head at Well Number 10	=	3963.9	3960.6	3.3
Head at Well Number 11	=	3957.8	3964.4	-6.6
Head at Well Number 12	=	3988.5	3985.8	2.7



USATHAMA
REMEDIAL INVESTIGATIONS
SIERRA ARMY DEPOT

FIGURE K-7: LOCATIONS OF WELLS USED FOR MODEL CALIBRATION

PREPARED BY
JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

and correlated relatively poorly with model simulations. Since simulated discharge was averaged over a 3,000-by-5,000-footcell area, and actual discharge occurs only at a well, producing a close match at this cell location would have required redefining the model grid, which would have been an unwarranted effort considering the distance to SIAD at this location. Wells 4 and 11 were influenced by pumping and boundary conditions and did not correlate as well with measured values as did other wells.

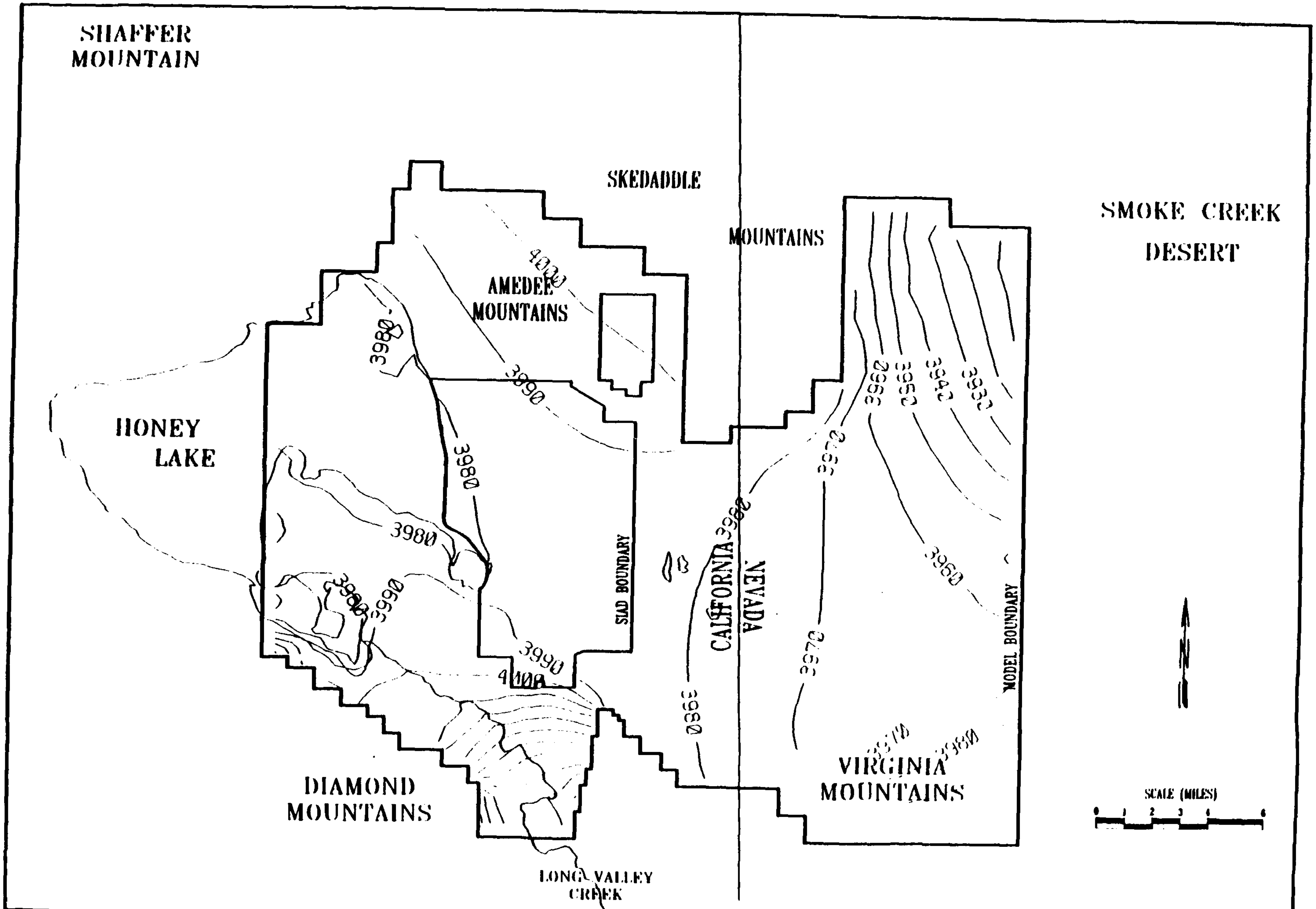
Little data was available from which to contour initial water table conditions over much of the western model area. Data from wells 5,6,and 7 near Honey Lake indicated water levels to be very stable in this area.

The lake level and areal extent of Honey Lake undergoes large fluctuations in response to annual precipitation and snowpack. The years 1987-1989 had below normal amounts of precipitation (Handman, et al, 1990). Consequently the surface of the lake declined during this time, and the shoreline receded significantly from what was depicted in Figure 8. Head contours passing through the lake were therefore considered to be representative.

Water table contours simulated by the model indicated the presence of a low groundwater divide several miles east of Honey Lake, and groundwater outflow across the eastern boundary of the model. The hydraulic gradient in the central portion of Honey Lake Valley was extremely flat. The gradient rapidly steepened south of the Herlong wells where groundwater is entering the basin through Long Valley. Water table contours were affected by these wells.

Hydraulic conductivities at SIAD generally increased southward towards fluvial deposits of Long Valley Creek. Model values averaged 3 to 5 ft/day in the northern part of the base to over 50 feet/day in near Long Valley Creek. Recharge from Long Valley and Long Valley Creek appeared to be the major source of water for the production wells at Herlong.

In summary, the deviation of simulated water levels from initial levels under steady-state



USATHAMA REMEDIAL INVESTIGATIONS SIERRA ARMY DEPOT	FIGURE K-8: SIMULATED WATER TABLE IN HONEY LAKE BASIN ELEVATIONS IN FEET ABOVE SEA LEVEL	PREPARED BY JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.

conditions was approximately 3.0 feet or less in all calibrations wells, with the exceptions of wells 4,9, and 11 as previously noted. These wells matched measured values to within 6 to 9 feet. Simulated heads at wells 5,6, and 7 near SIAD matched initial values to within about one foot. It should be noted that because of the limited number of wells throughout most of Honey Lake Basin, the piezometric surface at any specific location was somewhat conjectural.

K.5 Transient Model Calibration

After reasonable approximations of model parameters were attained from steady-state calibration runs, the model was simulated under transient conditions to observe and calibrate the response of the model to changes in recharge and discharge over time. The transient run simulated conditions over the two-year period mentioned in the section on steady-state calibration (April 1987 through March 1990). This simulation interval consisted of 24 stress periods of one month each.

Aquifer Storativity

Under transient conditions, the amount of water stored in a formation, aquifer storativity, becomes a factor in aquifer response. Storativity, or storage coefficient (S) is volume of water an aquifer will absorb or discharge from storage per unit surface area per unit change in head. In unconfined units water can also come from dewatering of aquifer materials, as well as compression of the aquifer mineral skeleton and expansion of water in the formation as with confined aquifers. Storativity in unconfined aquifers is described by specific yield (Sy) which varies directly with changes in saturated aquifer thickness.

Specific yields assigned to model layer 1 ranged from approximately 1 percent to 25 percent depending on lithology. Specific yield for central basin deposits was designated as 6 percent, and up to 25 percent for fluvial sediments. Values of storativity for deeper layers was assumed to be about 1,000 to 2,000 times smaller than specific yield.

Variable Model Parameters in Transient Calibration

Pertinent model factors that varied during the transient calibration were seasonal

variations in recharge, and fluctuations in well discharge. Changes in pumping for the production wells at Herlong are shown in Table K-1. This pumping pattern was assumed to repeat during the two-year transient simulation. Pumping of agricultural supply wells in Nevada occurs from April to October, and peaks in July and August. Model input simulated this pattern.

The most significant factor affecting transient simulations was seasonal variations in precipitation and consequently aquifer recharge. Most precipitation in Honey Lake Valley and the surrounding mountains occurs in the winter, from October through March, with the greatest amounts in December and January (California National Climatic Center, 1989). Aquifer recharge lags a month or two behind precipitation (Figure 9) with maximum recharge occurring in February and March (Handman, et al, 1990). For the transient calibration monthly recharge was simulated as the proportion of total yearly recharge in Figure K-9. This was also the basis for varying recharge from Long Valley Creek which was simulated by injection wells, although the pattern of river recharge was not identical that of precipitation recharge.

Finally, general-head values in boundary cells were varied seasonally on a trial and error basis until simulated water levels emulated measured values.

Calibration Results

Hydrographs were plotted for the twelve wells used for model calibration and the respective head values simulated by the model for layer 1 (Figures K-10 through K-21). Water level elevations above mean sea level were plotted against 24 one month stress periods starting in April 1987.

Water levels were very stable through the simulation period in most of the wells. Well 3 showed large head fluctuations due to pumping which were not duplicated by the model. Figure K-12 indicated two major pumping and recovery events within the simulation period, with water level minima occurring in September 1987, and August 1988. Poor model correlation in this well was explained earlier by the fact that the model averaged drawdown over the entire area of the cell in which pumping occurred, and the

FIGURE K-9: MEAN MONTHLY RECHARGE (HONEY LAKE VALLEY)
(DATA FROM HANDMAN, et al, 1990)

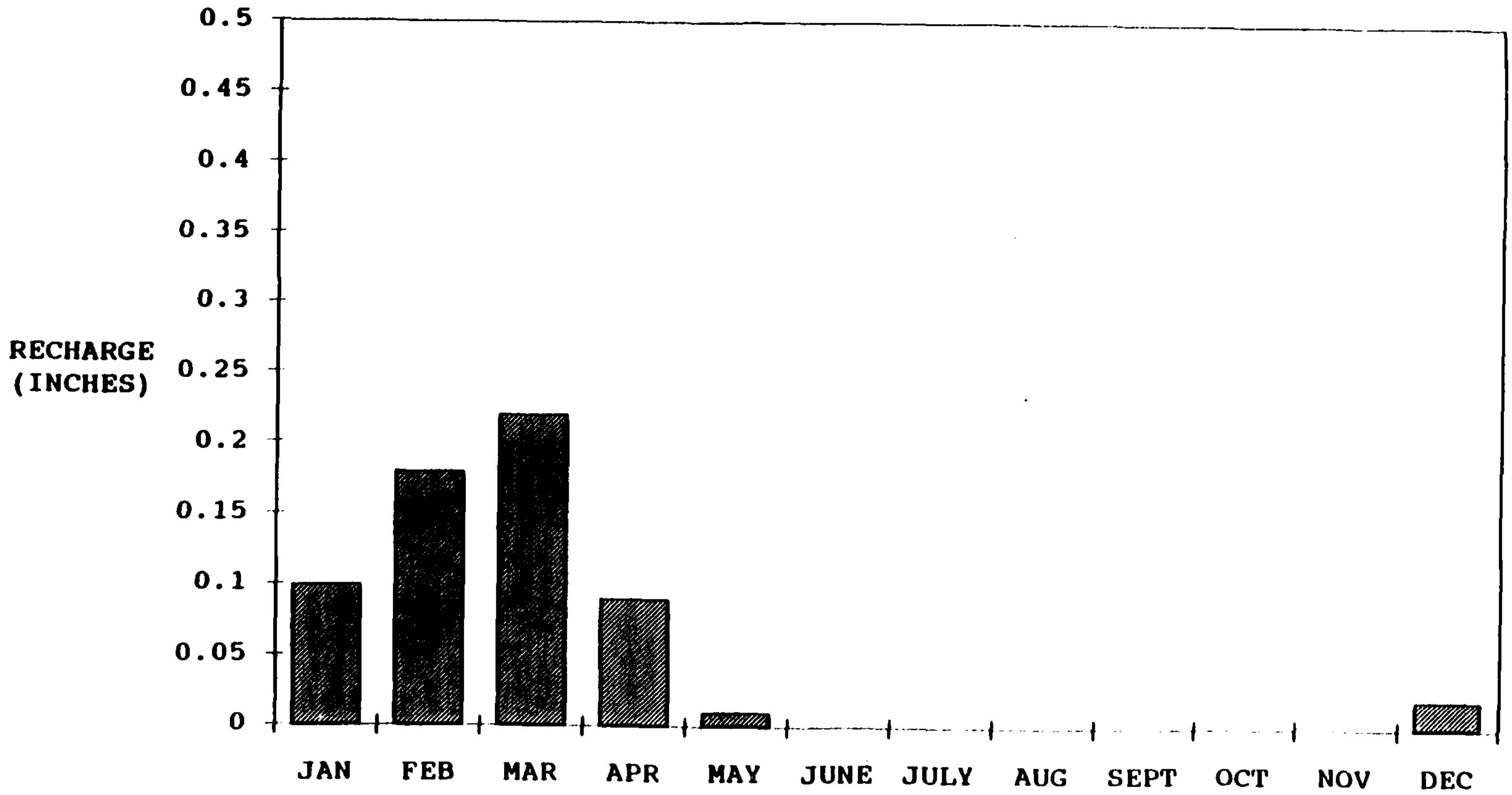


FIGURE K-10: WELL 1 HYDROGRAPH FOR TRANSIENT SIMULATION

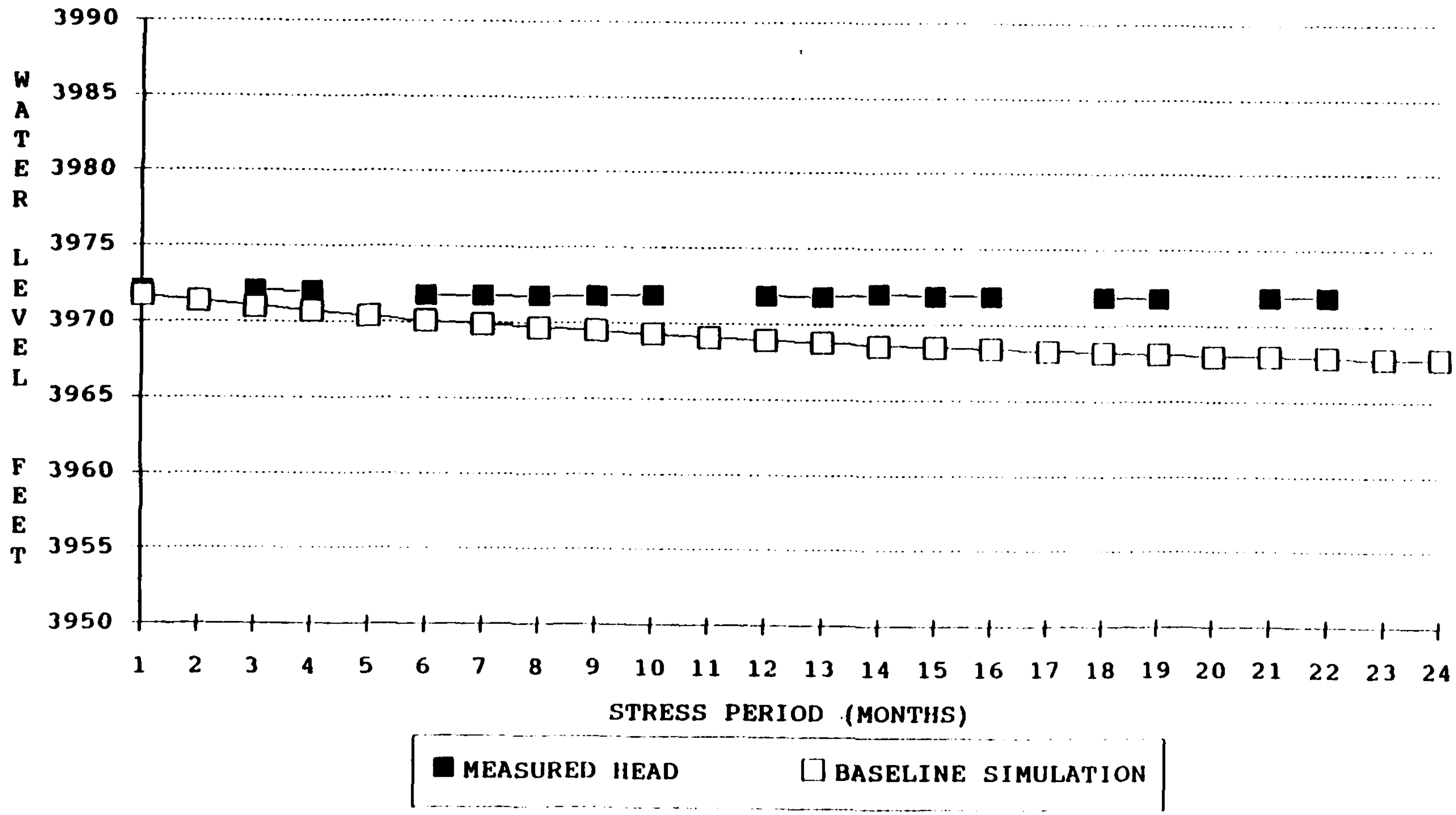


FIGURE K-11: WELL 2 HYDROGRAPH

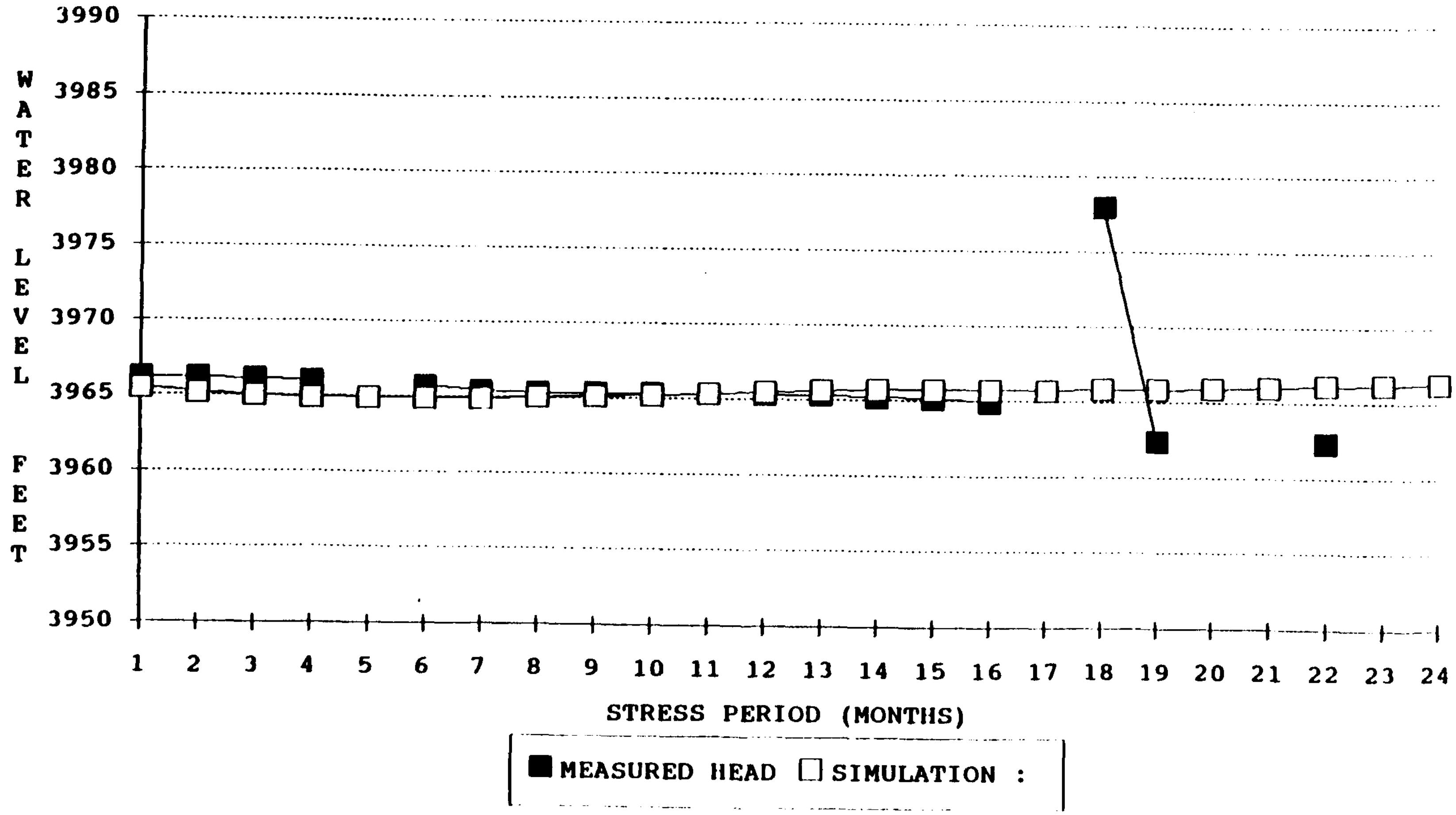


FIGURE K-12: WELL 3 HYDROGRAPH FOR TRANSIENT CALIBRATION

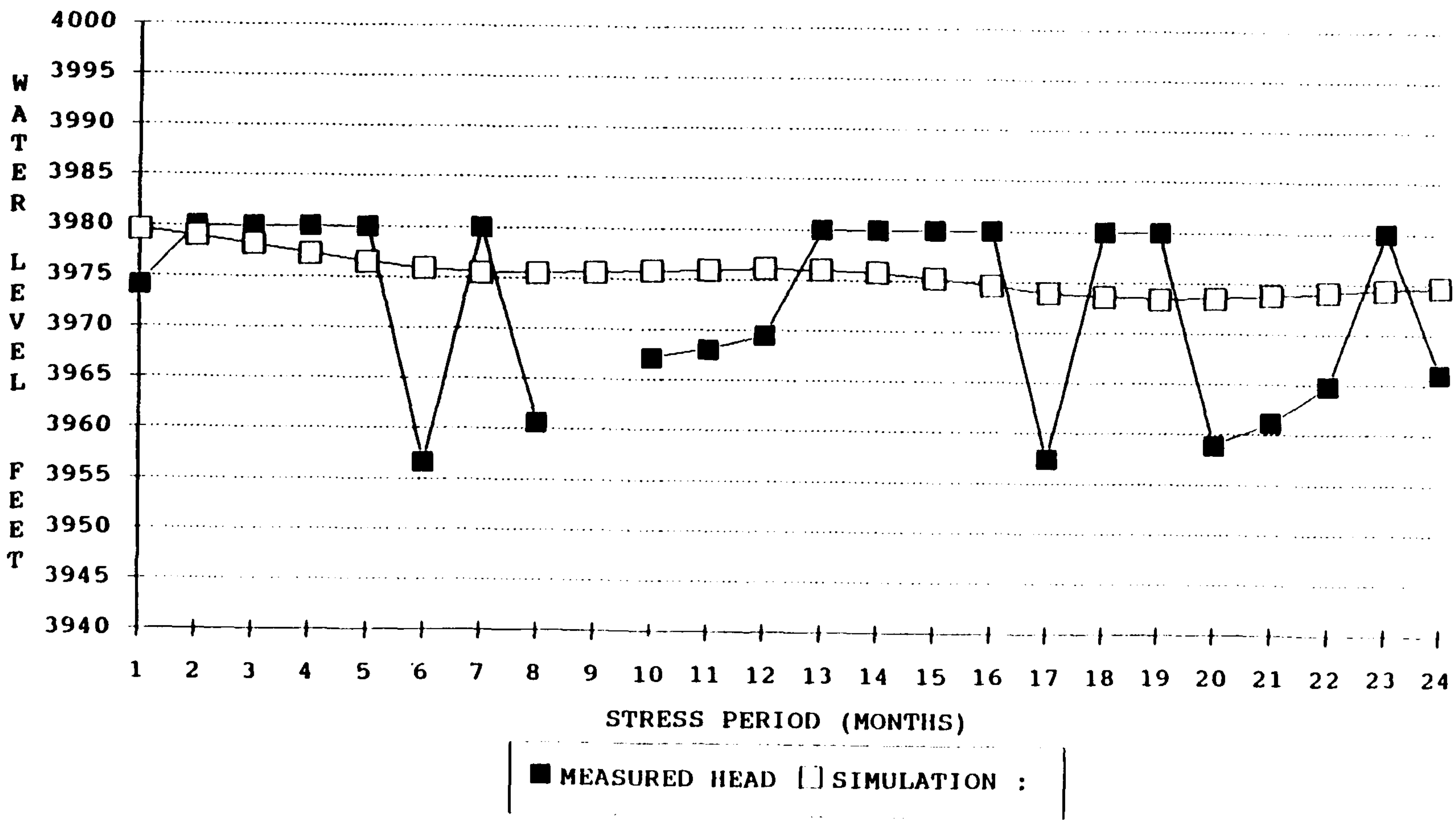


FIGURE K-13 : WELL 4 HYDROGRAPH

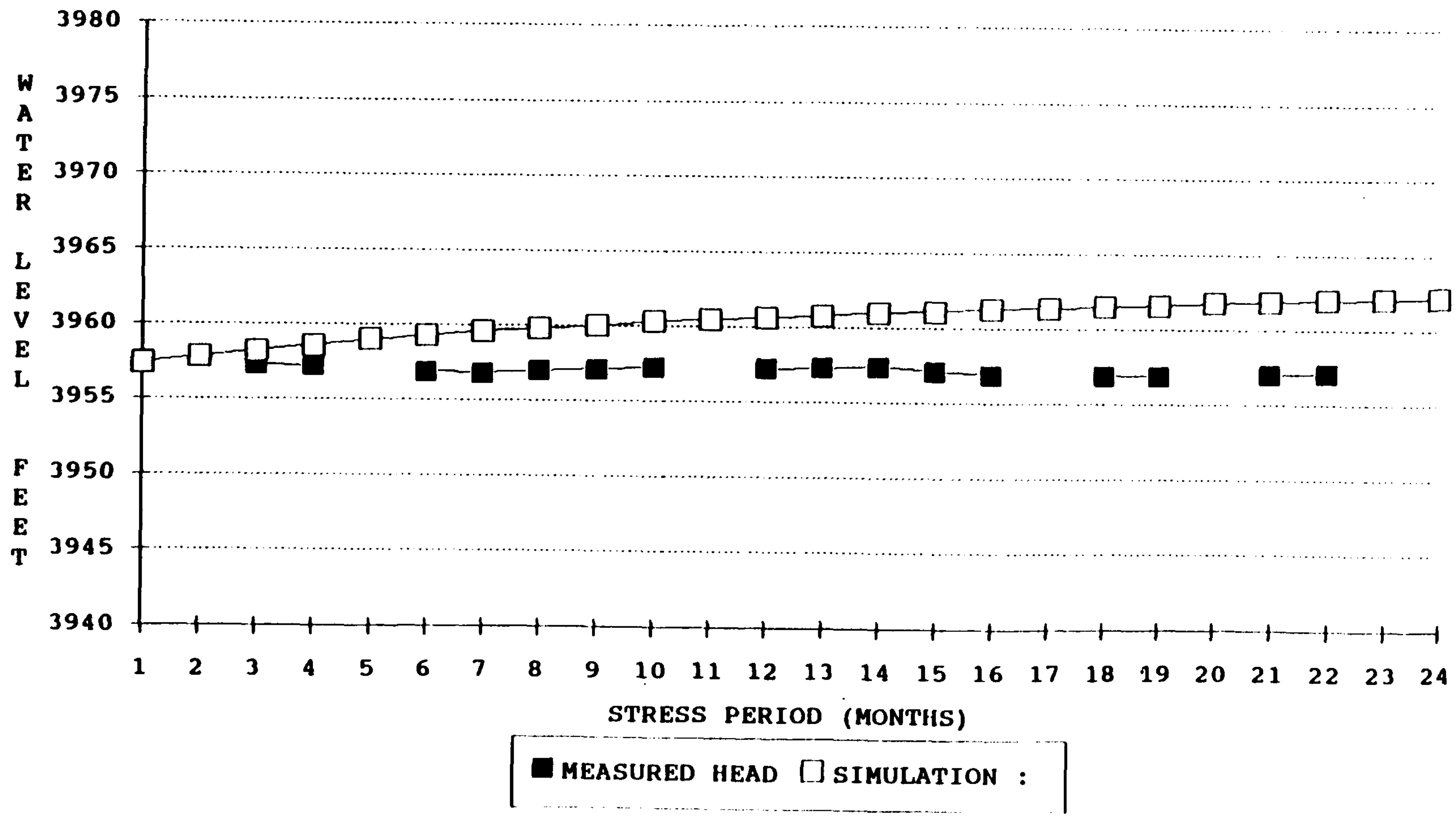


FIGURE K-14: WELL 5 HYDROGRAPH

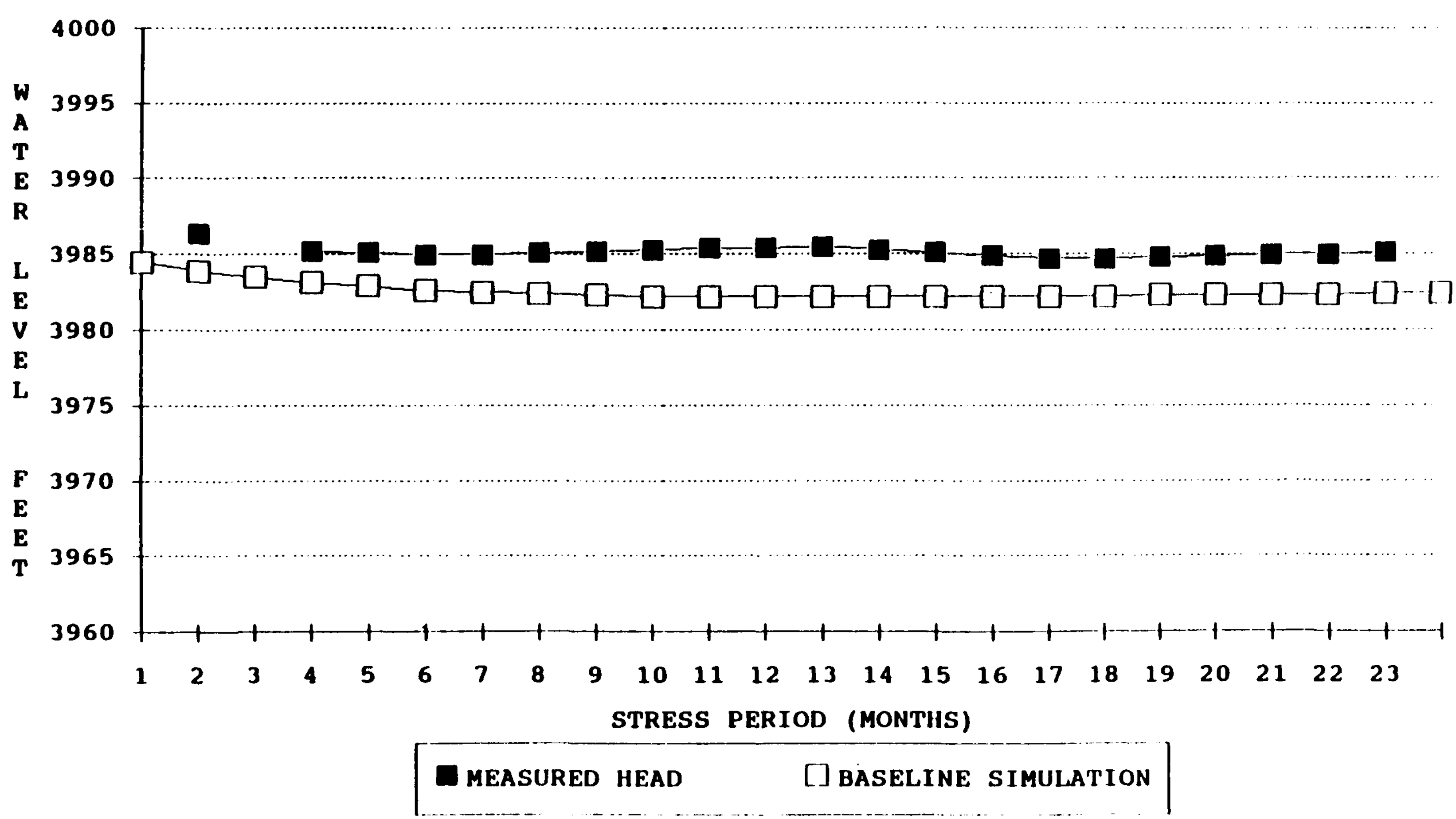


FIGURE K-15: WELL 6 HYDROGRAPH

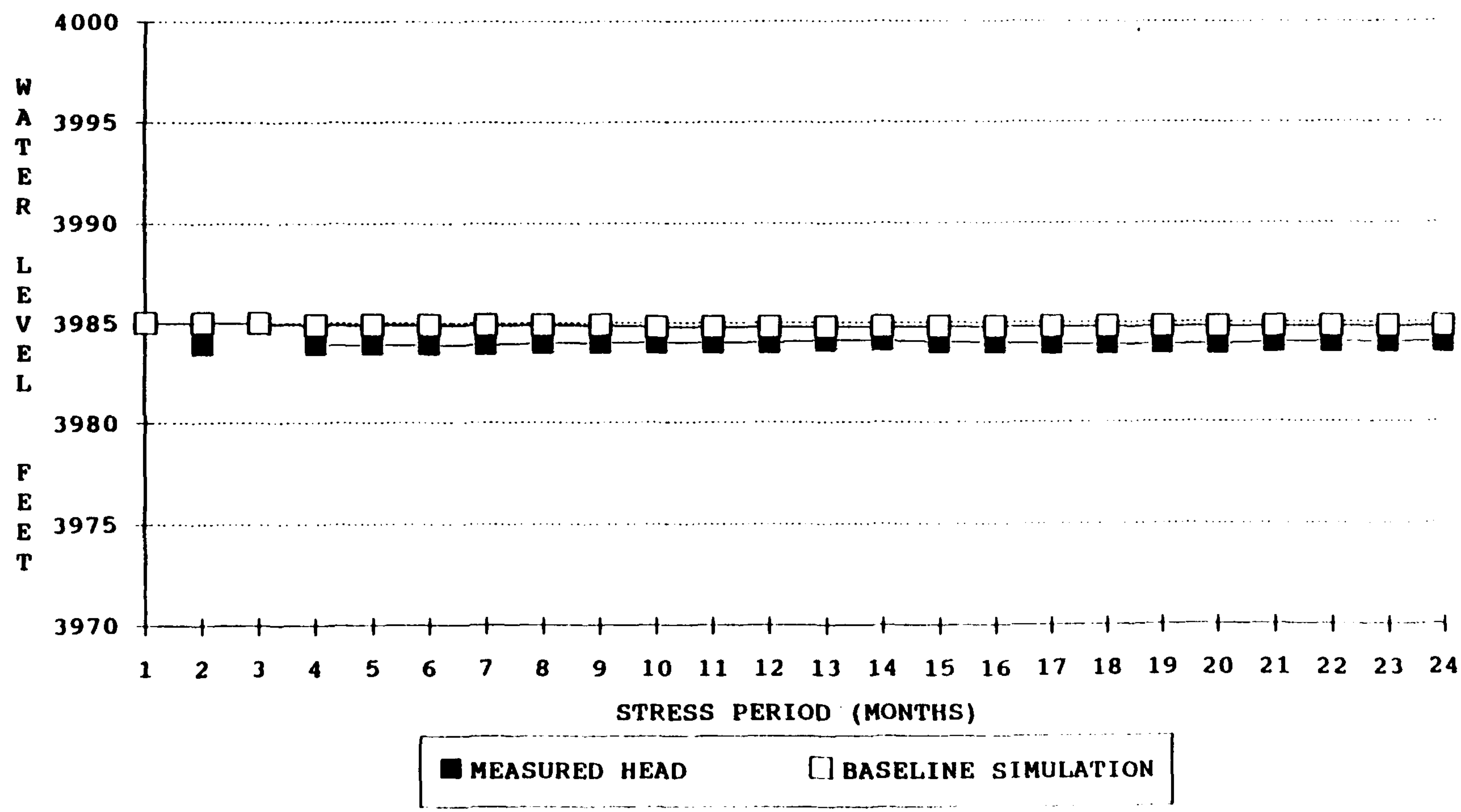


FIGURE K-16: WELL 7 HYDROGRAPH

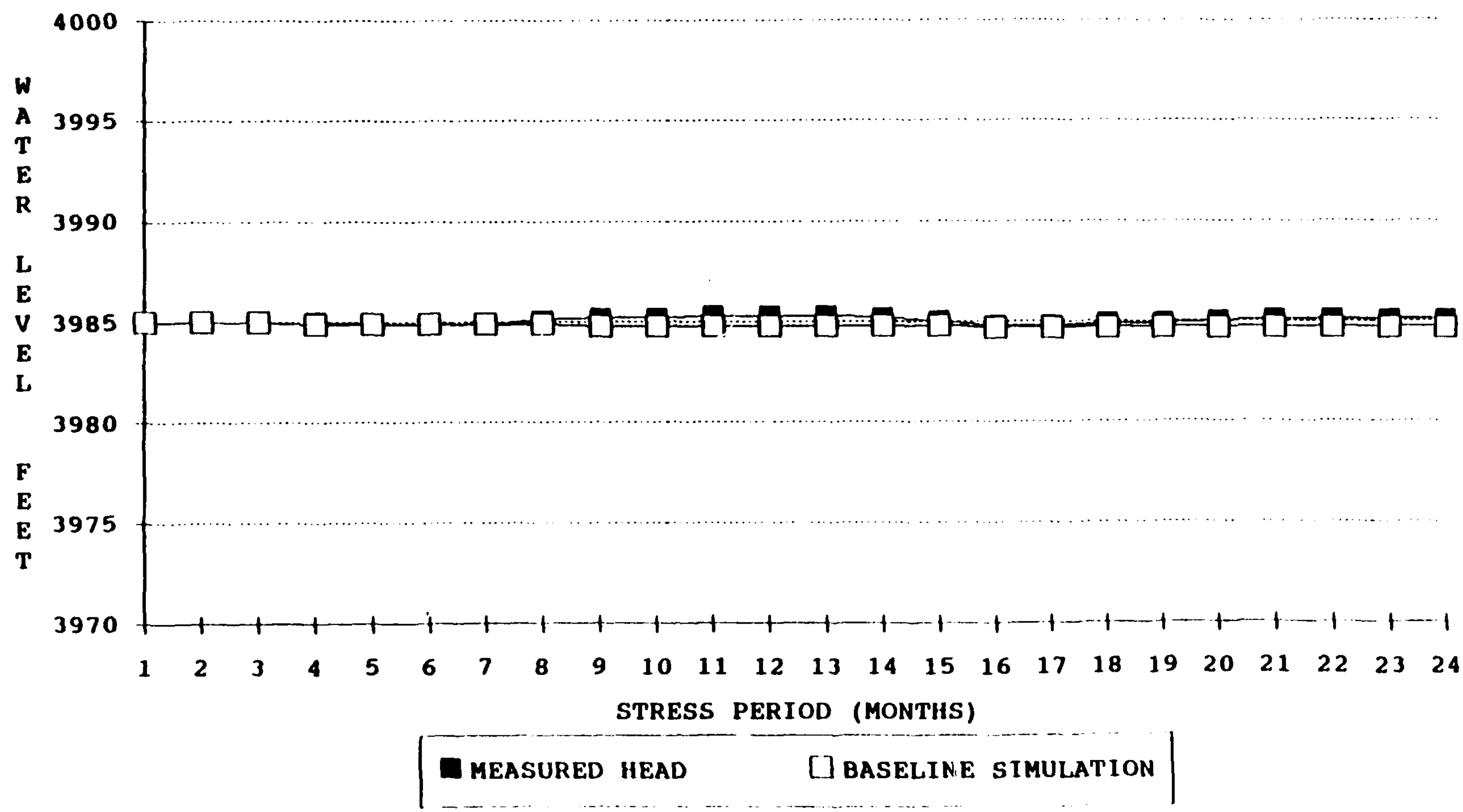


FIGURE K-17: WELL 8 HYDROGRAPH FOR TRANSIENT SIMULATION

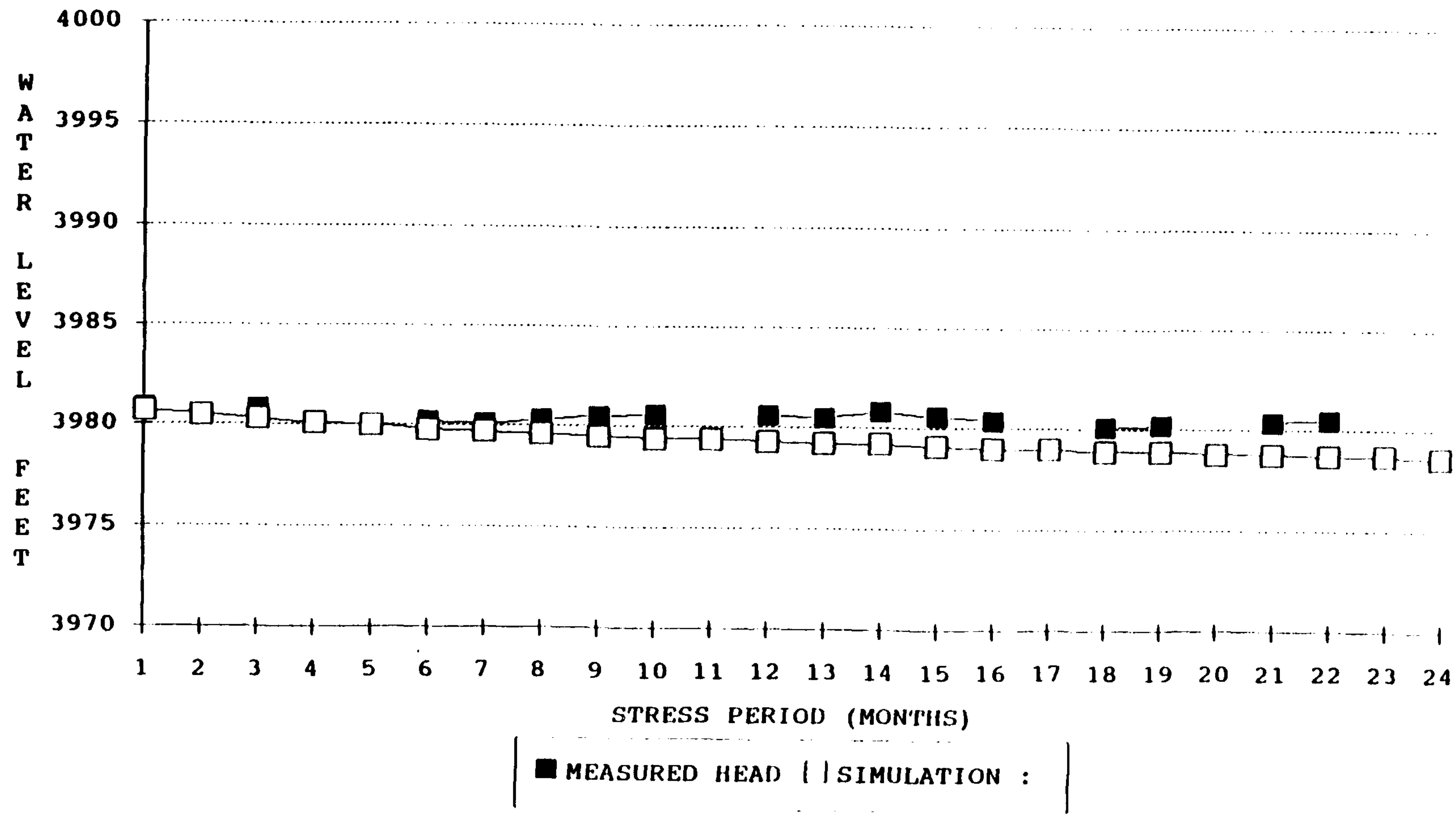


FIGURE K-18: WELL 9 HYDROGRAPH

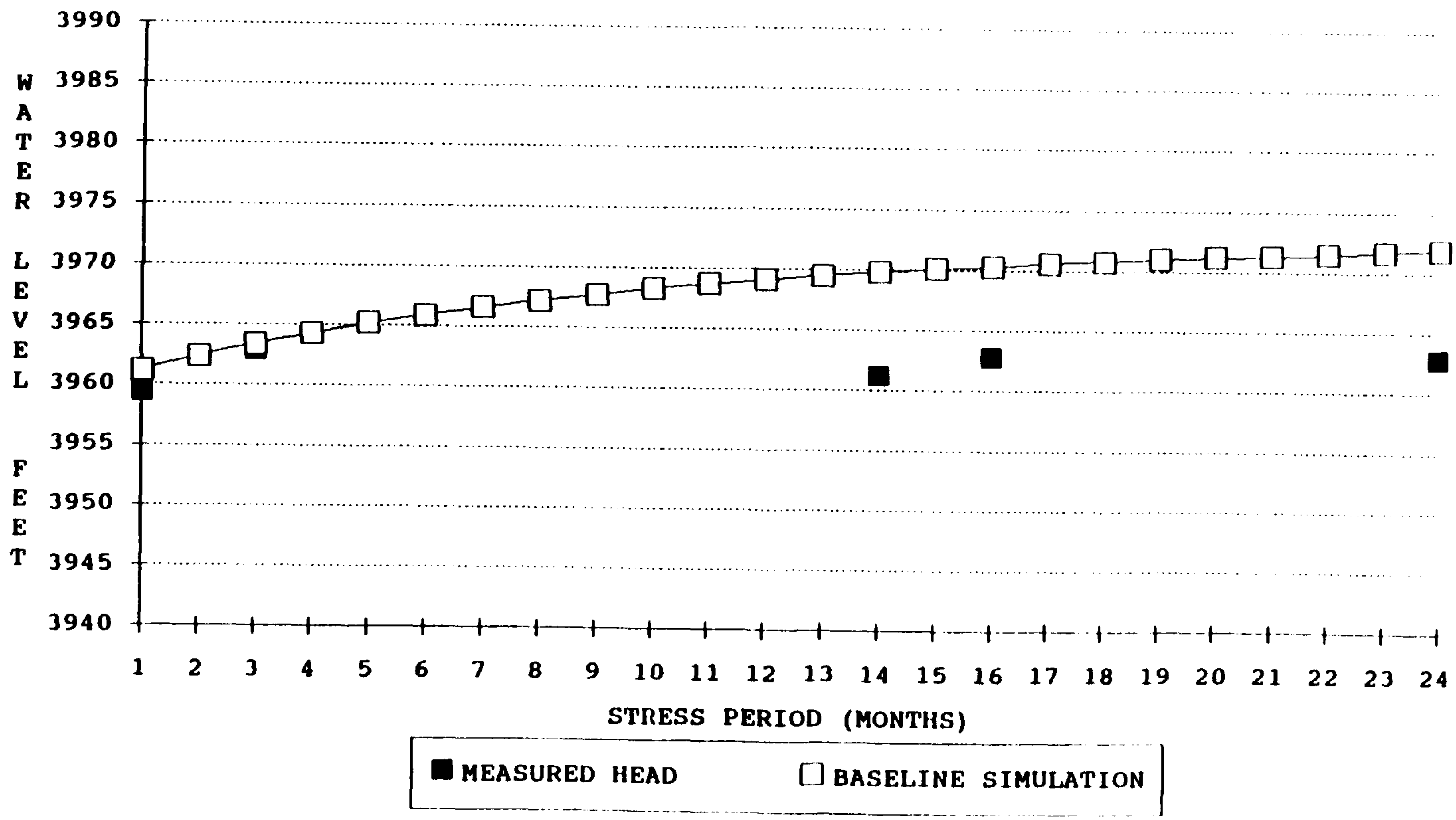


FIGURE K-19: WELL 10 HYDROGRAPH

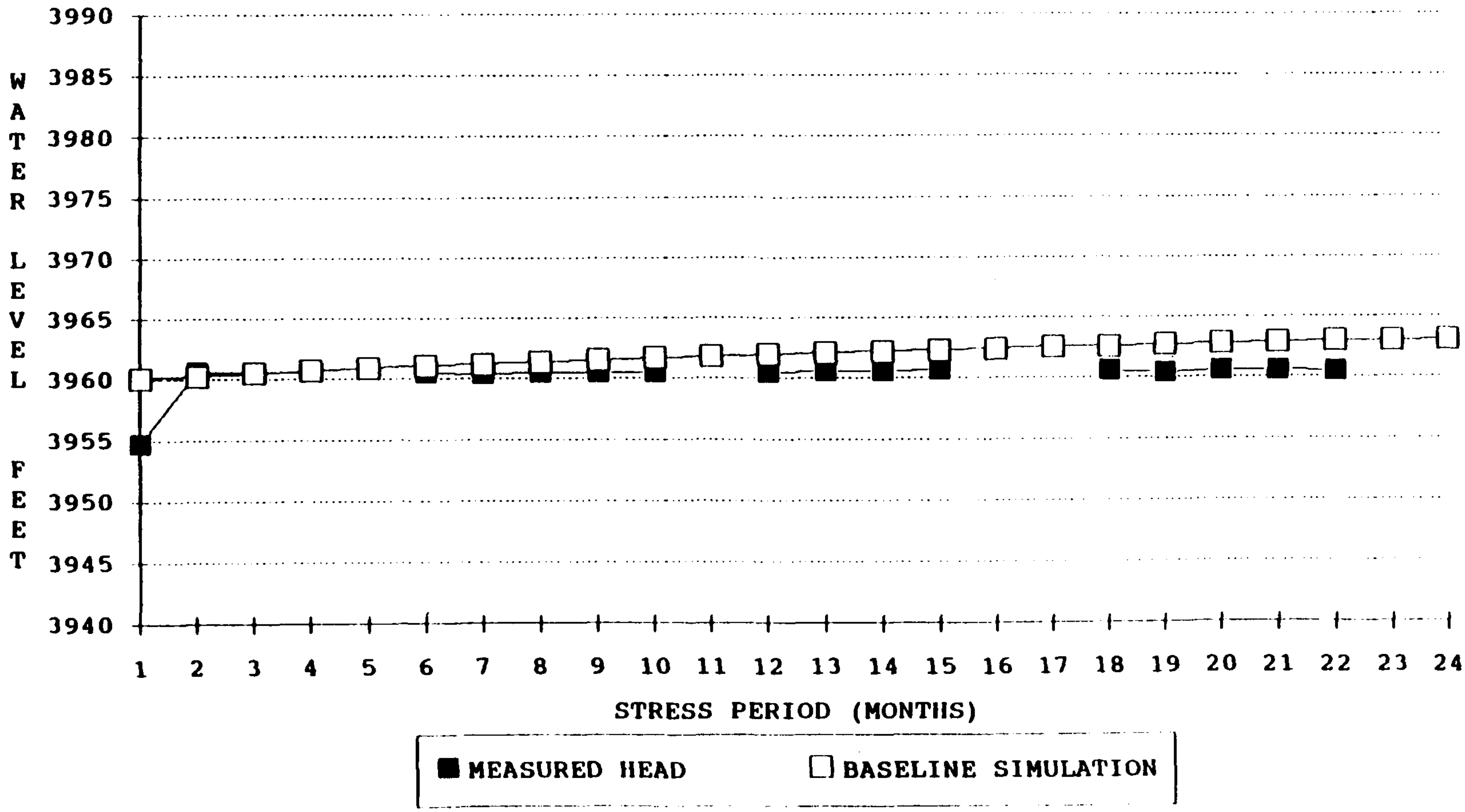


FIGURE K-20: WELL 11 HYDROGRAPH

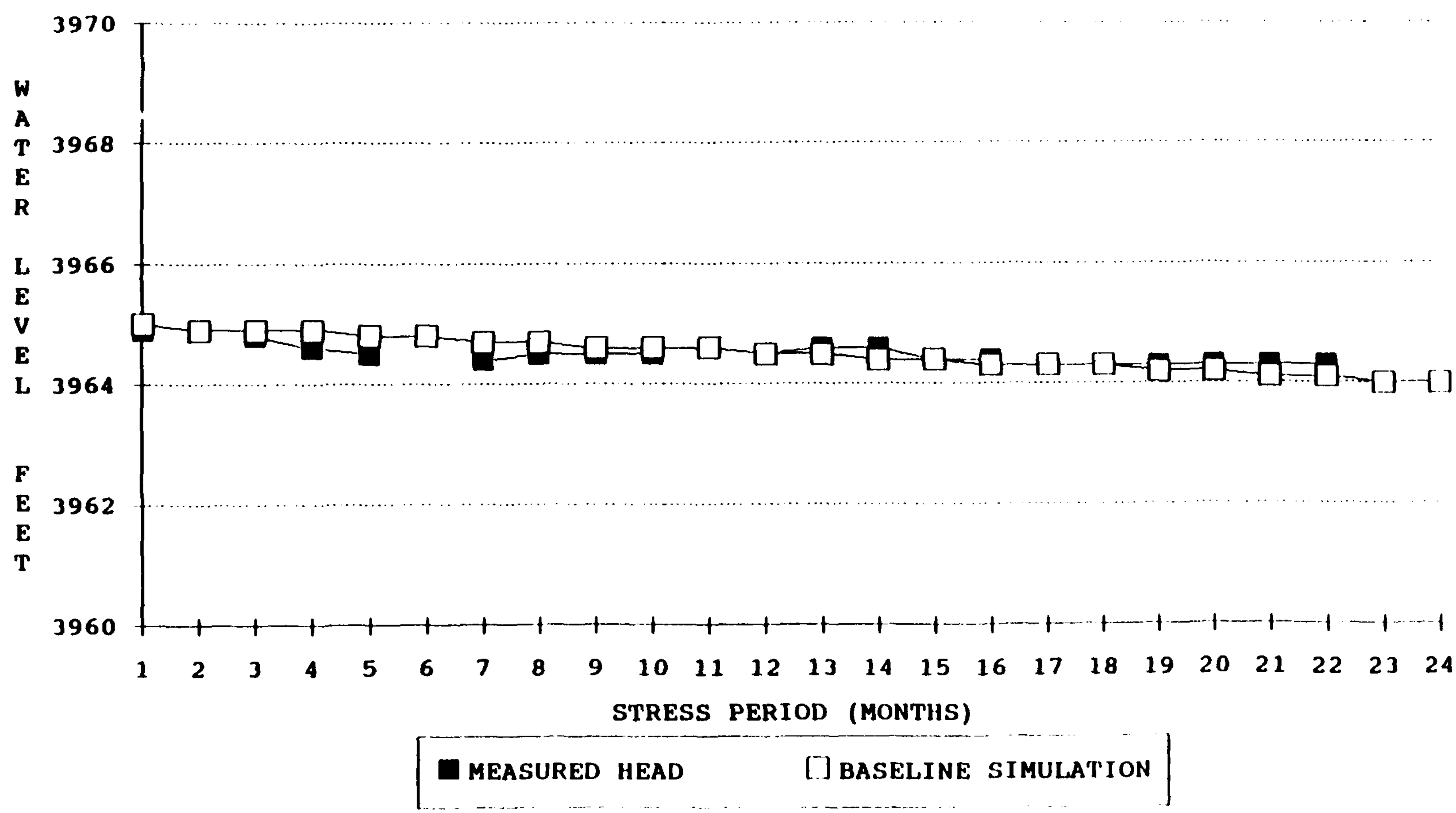
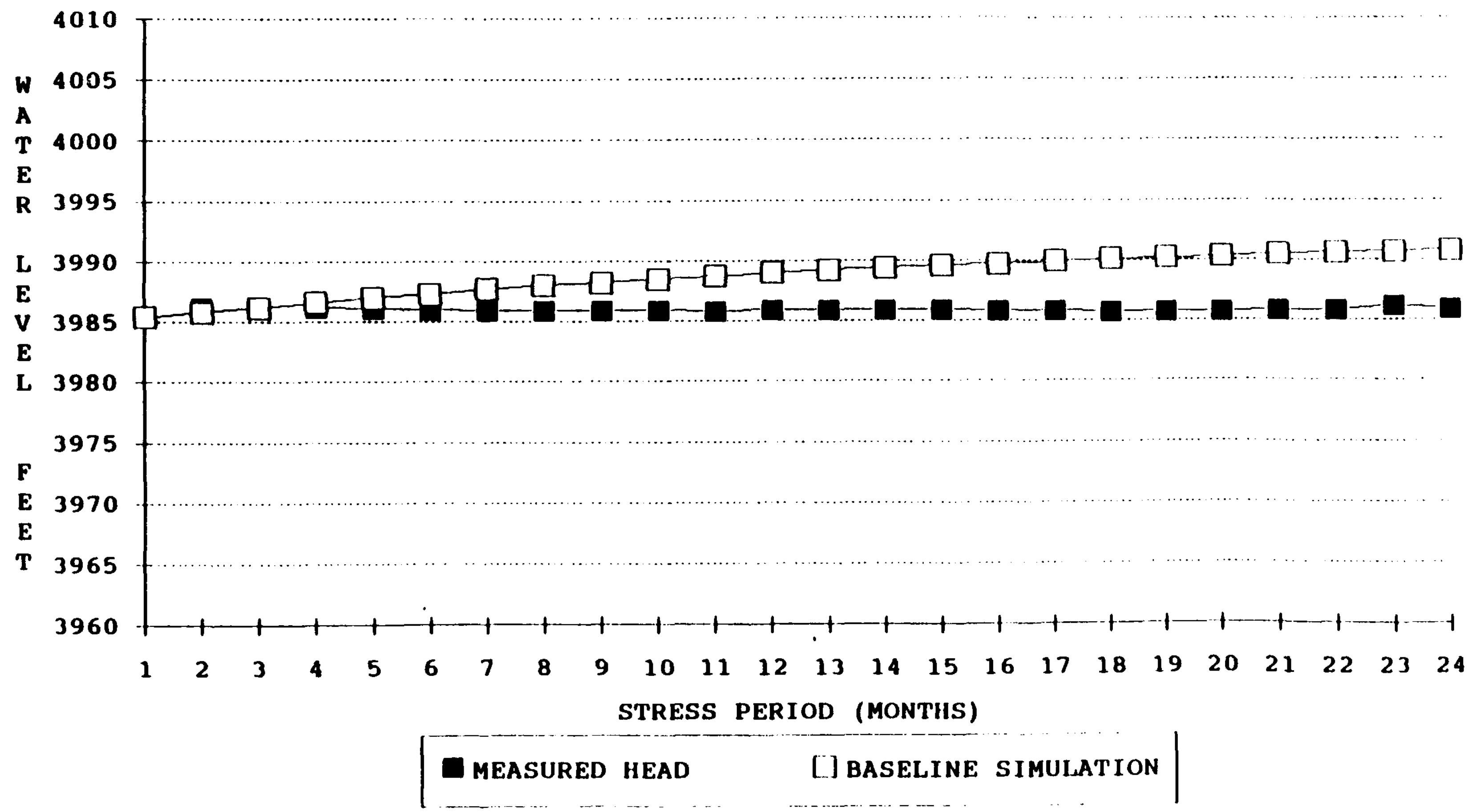


FIGURE K-21: WELL 12 HYDROGRAPH



model grid was very coarse in this area.

Most simulated water levels matched measured values fairly closely. The anomalously high measured value for Well 2 (Figure K-11) can be disregarded as a measuring error or recording error. Pumping influences in Well 4 (Figure K-13) may explain the divergence of simulated water levels with measured levels. Wells near SIAD showed good to very good matches between measured and simulated values (Figures K-14, K-15, and K-17).

The paucity of water level monitoring data at Well 9, its location at the margin of the basin, and possibly unaccounted for pumping influences, elicited a less accurate model simulation at this location than for most other wells. The transient calibration can be refined as additional data becomes available.

Changes in aquifer storativity and recharge had only minor impact on transient model calibration, probably due to low conductivity within the central-basin area, and the relatively short simulation period. Changes in these model inputs should have greater significance over longer simulation periods.

K.6 Model Sensitivity

The model was sensitive to overall changes in hydraulic conductivity, recharge, and to changes along any large section of the general-head boundaries. Root-mean-square deviation (or error) was used to estimate model accuracy by quantifying the differences between simulated and measured head values. Root-mean-square deviation (RMSD) is defined by the following equation:

$$RMSD = \frac{\sqrt{\Sigma (M - C)}^{2}}{N}$$

where M = measured water level
C = head simulated by model
N = number of water level measurements

The RMS error for the steady-state calibration was about 3.8 feet, and the greatest difference between measured and simulated heads was 8.5 feet. Most wells in the eastern portion of the model area were influenced by groundwater pumping and had depressed water levels which may have yet to reach steady-state equilibrium.

Model sensitivity was evaluated by varying individual model parameters in the steady-state runs from baseline values and comparing those deviations against baseline RMSD. Figure K-22 is a plot of RMS error against the ratio of a modified model parameter value against the baseline value for that factor. An increase in the RMS error is a measure of the sensitivity of the model to changes in that parameter. Changes in hydraulic conductivity, and increases in recharge, produced a large change in RMS error with a relatively small change from the baseline value, whereas sensitivity to changes in vertical leakage between layers and reduction in recharge are much less pronounced.

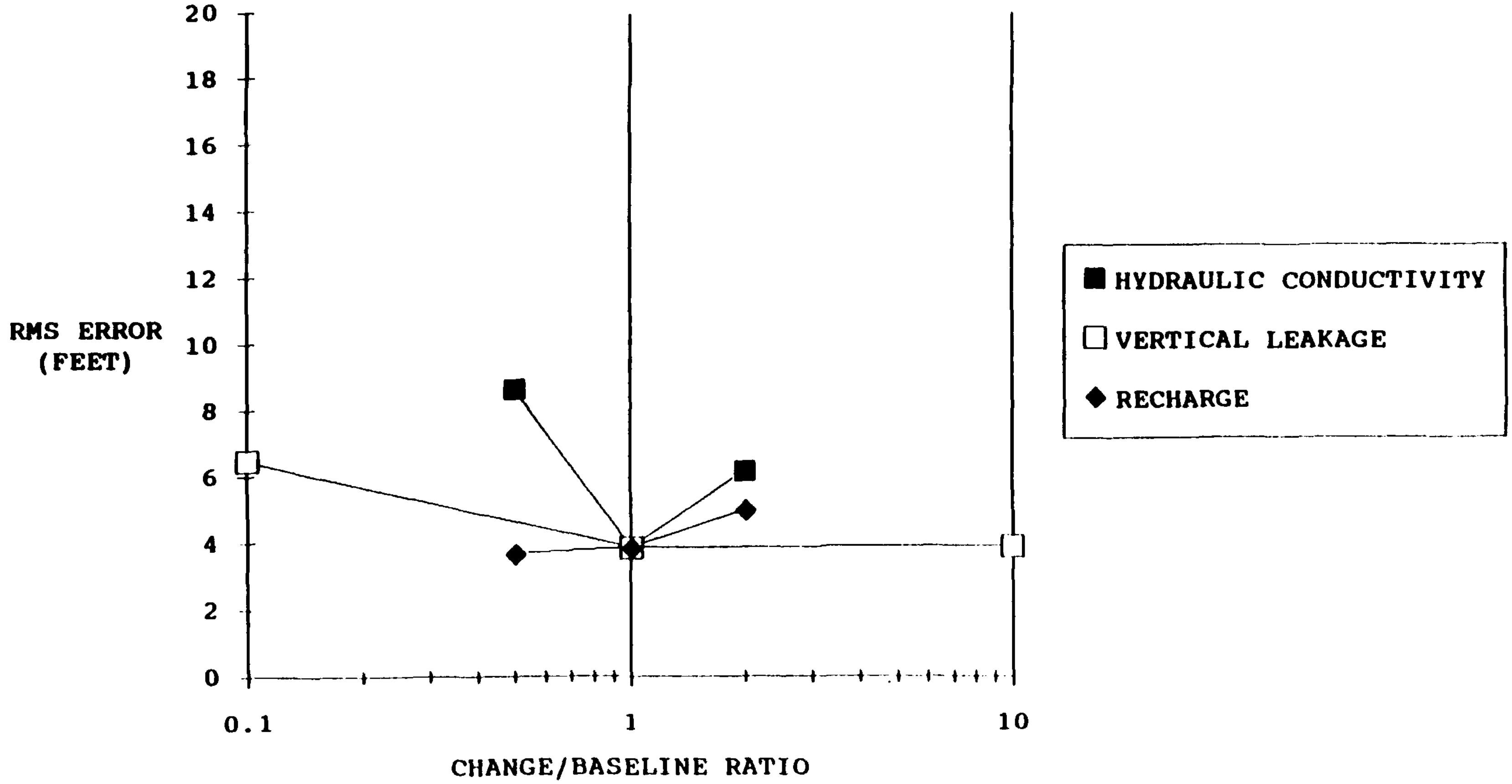
The mass-balance discrepancy between flow in and out of the aquifer under baseline conditions was approximately 0.5 percent.

K.7 Conclusions

The primary focus of the modeling effort at Honey Lake Valley was to define groundwater flow conditions in the vicinity of Sierra Army Depot and, to a lesser extent, Honey Lake Basin. Hydraulic conductivity is generally low throughout the central-basin sediments, and higher towards the periphery of the basin, in the volcanic mountains surrounding the basin, and in the vicinity of Long Valley Creek. Groundwater recharge occurs primarily from southern and northern mountain areas and infiltrates the basin through alluvial fans along the basin perimeter. Groundwater flow is mainly eastward through the basin and exits at the northeastern boundary towards the Smoke Creek Desert.

Hydraulic gradients in the central Honey Lake basin are extremely flat. A low groundwater divide several miles east of Honey Lake indicates flow towards the lake in shallower aquifer zones. Aquifer properties in the shallow zones at SIAD were very

FIGURE K-22 : SENSITIVITY ANALYSIS FOR STEADY-STATE CALIBRATION
ROOT-MEAN-SQUARE DEVIATION FROM BASELINE CONDITIONS



heterogeneous and suggested a mixture of silt/clay and sandy lenses within the aquifer.

The model was sensitive to estimation of conductivities throughout the model area, and relatively insensitive to changes in other model parameters. Further refinement of the model should continue as new data becomes available.

REFERENCES

California Department of Water Resources, 1963a, Northeastern counties ground water investigation: California Department of Water Resources Bulletin 98, v.1, 224 p.

------- 1963b, Northeastern counties ground water investigation: California Department of Water Resources Bulletin 98, v.2, 224 p.

California National Climatic Data Center, 1989, Monthly Summarized Station and Divisional Data, Ashville, North Carolina, Dept. of Commerce.

Driscoll, F.G., 1986, Groundwater and Wells, Johnson Division, St. Paul, Minnesota, 1089 p.

Freeze, R.A., and Cherry, J.A., 1979, Groundwater: Englewood Cliffs, N.J., Prentice-Hall, 604 P.

Handman, E.H., C.J. Londquist, and D.K. Maurer, 1990, Ground-water Resources of Honey Lake Valley, Lassen County, California, and Washoe County, Nevada, U.S.G.S. Water-Resources Investigations Report 90-4050, 128 p.

McDonald, M.G., and Harbaugh, A.W., 1988, A modular three dimensional finite-difference ground-water flow model: U.S. Geological Survey Techniques of Water-Resource Investigations, Book 6, Chapter A1, 586p.

U.S. Army Corp of Engineers, 1961, Report on New Water Well No. 2 for Sierra Ordnance Depot, Herlong, California, U.S. Engineer District Corp of Engineers, Sacramento, California, 6 p.

U.S. Army Corp of Engineers, 1964, Report on New Water Well No. 8 for Sierra Ordnance Depot, Herlong, California, U.S. Engineer District Corp of Engineers, Sacramento, California, 6 p.

Walters, Ball, Hibdon, and Shaw Civil Engineering Consultants, Reno Nevada, 1969, Report on New Water Well No. 9 for Sierra Depot, Herlong, California, for Department of the Army, Sacramento District, Corp of Engineers, Sacramento, California, 11 p.

Appendix L

Aquifer Test Results

JMM James M. Montgomery
Consulting Engineers Inc.

APPENDIX L
AQUIFER TEST RESULTS

A series of pump tests were conducted at SIAD to obtain estimates of aquifer transmissivity, vertical conductivity, and storage coefficient. These tests fell into two categories: 1) one hour constant discharge pump tests conducted on all newly installed water table monitoring wells, and 2) four hour step-drawdown tests at the "B" and "C" zone wells at the TNT Leaching Beds Area. The Jacob analysis (Cooper and Jacob, 1946) was used to estimate aquifer parameters. In all cases wells were only partially penetrating and the true aquifer thickness was unknown. However, good estimates of localized hydraulic conductivity can still be obtained if there is little vertical flow towards the wells, which appears to be the case at SIAD. The saturated wellbore thicknesses were used in calculating apparent transmissivities and, subsequently, hydraulic conductivities. Table L-1 summarizes results of these aquifer tests.

Constant-discharge Pump Tests

One hour pump tests were performed at the Abandoned Landfill, Chemical Burial Site, Construction Debris Landfill, DRMO Trench Area, and the TNT Leaching Beds Area. Data for drawdown vs. time for semi-log is presented at the end of this Appendix. Data from several of the tests plotted erratically, primarily due to fluctuations in discharge. However, in most cases, good values of transmissivity were obtained from the straight-line portions of the data. No observation well was expected in tests of such short duration, and no observation wells were monitored in any of the one-hour pump tests. Wells used in these tests were screened in the top 13 to 15 feet of the aquifer.

Analysis Methodology

The Theis nonequilibrium formula (Theis, 1935) for transient aquifer drawdown is

$$s = \frac{Q}{4\pi T} W(u)$$

APPENDIX L

TABLE 1: PUMP TESTS AT SIAD

Well	TD (ft)	b' (ft)	T (ft^2/day)	Test	K' (ft/Day)	r (ft)	S
ALF 1 MWA	105	14	1510	PT	108		
ALF 2 MWA	101	14	142.8	PT	10.2		
ALF 3 MWA	100	14	65.8	PT	4.7		
CCB 1 MWA	93	14	899.5	PT	64.3		
CCB 2 MWA	100	14	63.5	PT	4.5		
DMO 3 MWA	110	14	ND	PT	ND		
DMO 3R MWA	110	14	2.94	PT	0.21		
DMO 4 MWA	110	14	22.9	PT	1.6		
DMO 4R MWA	110	14	10.9	PT	0.78		
TNT 16 MWA	73	14	27.6	PT	2		
TNT 16R MWA	73	14	17.2	PT	1.2		
TNT 1B-PROD	100	40.8	6.61	ST	0.16		
TNT 1C-PROD	140	82	448.7	ST	5.47		
TNT 2B-PROD	100	43.6	1636.5*	ST	ND		
TNT 2B-OBS3		43.6	2100.6*	ST	ND	8	0.081
TNT 7B-PROD	100	41.6	138	ST	3.32		
TNT 7B-OBS3			2647.5	ST	ND	10	ND
TNT 7C-PROD	140	81	22.9	ST	0.28		
TNT 10B-PROD	100	41	53.3	ST	1.3		

PT = 1-hour pump test.
ST = Step-drawdown test.
ND = Not determined.
* Not considered valid, substantial vertical flow.

where

s=drawdown
Q=well discharge
T=aquifer transmissivity
W(u)= the well function of u
$u=\frac{r2S}{4Tt}$
r=radial distance from well
t=time since start of pumping
S=aquifer storage coefficient

in consistent units. For small values of u, the Theis equation can be approximated by the Jacob equation (Cooper and Jacob, 1946) as

$$s = \frac{2.3\,Q}{4\pi T}\ \log\ \frac{2.25\ Tt}{r^2 S}$$

Aquifer transmissivity and storativity are therefore defined by the following equations:

$$T = \frac{2.3\,Q}{4\pi\Delta s} \qquad S = \frac{2.25\ Tt_o}{r^2}$$

When pumping well data is used for aquifer analysis, the Jacob approximation becomes valid almost immediately because r is so small.

Constant-discharge Test Results

Transmissivities from these tests ranged from approximately 2.9 ft^2/day to 1500 ft^2/day. This wide range of transmissivity reflects the heterogenous nature of aquifer materials SIAD. In general, transmissivities were lowest at the DRMO Trench Area, and highest at the Abandoned Landfill.

Step-drawdown Tests

The aquifer tests at the TNT site were originally planned to consist of four one-hour steps. However, during the course of the tests, it was decided to use the first pumping step to estimate the maximum expected drawdown, and then maintain the highest sustainable discharge for the remainder of the test, in order to stress the aquifer as much as possible.

The Birsoy and Summers (1980) method of correcting time for later pumping steps was used to analyze the step-test data. Three to four observation wells were monitored during each test. Two observation wells were very close to each pumping well (~ 10 feet) but screened at different intervals. Remaining observation wells were more distant (100 to 400 feet) and also screened at different intervals. Only one of the tests showed any usable response in an observation well. Well TNT-07-MWC (TNT-7B-OBS3 in Table I-1) showed a slight response to the pumping well (10 feet away), but was considered to have a poor hydraulic connection to that well and, therefore, unusable data. The water table observation well for TNT-2B-PROD (TNT-02-MWA) appeared to have a usable response. Transmissivity of the observation well (2100 ft2/day) compared well with the production well value (1636 ft2/day). Response in the observation well suggested more homogeneous conditions here than elsewhere at the site, and a higher vertical conductivity in this zone. However, because of these facts, the assumption of negligible vertical flow towards the pumping well explicit in the Theis equation (Theis, 1935), upon which the Jacob method was based, was considered to have been violated, negating the quantitative usefulness of this data.

Summary

Based on the pump tests discussed above, it was concluded that, in general, the aquifer at SIAD is extremely heterogenous on a large-scale, and has a very low vertical permeability. Efforts to contour transmissivity from pump tests were unsuccessful because of these extreme variations, however, they did provide general estimates of aquifer parameters.

AQUIFER TESTS AT SIAD

SEMI-LOG PLOTS:

CONSTANT-DISCHARGE TESTS

WELL:

ALF-01-MWA
ALF-02-MWA
ALF-03-MWA
CCB-01-MWA
CCB-02-MWA
DMO-03-MWA
DMO-03-MWA (RECOVERY)
DMO-04-MWA
DMO-04-MWA (RECOVERY)
TNT-16-MWA
TNT-16-MWA (RECOVERY)

STEP-DRAWDOWN TESTS:

TNT-01-MWB
TNT-01-MWC
TNT-02-MWB
TNT-02-MWB OBSERVATION WELL (TNT-02-MWC)
TNT-07-MWB
TNT-07-MWC
TNT-10-MWB

Step-drawdown Tests

The aquifer tests at the TNT site were originally planned to consist of four one-hour steps. However, during the course of the tests, it was decided to use the first pumping step to estimate the maximum expected drawdown, and then maintain the highest sustainable discharge for the remainder of the test, in order to stress the aquifer as much as possible.

The Birsoy and Summers (1980) method of correcting time for later pumping steps was used to analyze the step-test data. Three to four observation wells were monitored during each test. Two observation wells were very close to each pumping well ($\sim$ 10 feet) but screened at different intervals. Remaining observation wells were more distant (100 to 400 feet) and also screened at different intervals. Only one of the tests showed any usable response in an observation well. Well TNT-07-MWC (TNT-7B-OBS3 in Table I-1) showed a slight response to the pumping well (10 feet away), but was considered to have a poor hydraulic connection to that well and, therefore, unusable data. The water table observation well for TNT-2B-PROD (TNT-02-MWA) appeared to have a usable response. Transmissivity of the observation well (2100 ft2/day) compared well with the production well value (1636 ft2/day). Response in the observation well suggested more homogeneous conditions here than elsewhere at the site, and a higher vertical conductivity in this zone. However, because of these facts, the assumption of negligible vertical flow towards the pumping well explicit in the Theis equation (Theis, 1935), upon which the Jacob method was based, was considered to have been violated, negating the quantitative usefulness of this data.

Summary

Based on the pump tests discussed above, it was concluded that, in general, the aquifer at SIAD is extremely heterogenous on a large-scale, and has a very low vertical permeability. Efforts to contour transmissivity from pump tests were unsuccessful because of these extreme variations, however, they did provide general estimates of aquifer parameters.

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: S1AD PHASE I RI   JOB NO. 2573.0011   DATE 6/7/90

SAMPLE LOCATION I.D. TNT-05-mw4   LOCATION ACTIVITY START: C800 END: C954

WATER LEVEL / WELL DATA

WELL DEPTH 65.84 FT ☒ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☒ TOP OF CASING ☐ ____ CASING STICK-UP (FROM GROUND) 2.0 FT

WATER DEPTH 60.60 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ____

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☒ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ____

WATER LEVEL EQUIP. USED: ☒ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ____

HEIGHT OF WATER COLUMN 8.24 FT x ☒ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.32 GAL/VOL

23 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☒ ☐
CONCRETE COLLAR INTACT ☒ ☐
OTHER ____

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR:

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☒	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD:
Steam Clean
Bailers
SS +-ench
SS -- e

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM   WELL MOUTH ____ PPM   FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 2 GAL	@ 10 GAL	@ 22 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	7.3	7.1	6.9		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	780	780	800		

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☒ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: S.A.D PHASE 1 RI | JOB NO. 2573 0041 | DATE 6/6/96

SAMPLE LOCATION I.D. TNT-06-MWA | LOCATION ACTIVITY START: 1425 END: 1535

WATER LEVEL / WELL DATA

WELL DEPTH: 68.56 FT — [x] MEASURED [ ] HISTORICAL; [ ] TOP OF WELL [x] TOP OF CASING [ ] ______

CASING STICK-UP (FROM GROUND): 2.9 FT

WATER DEPTH: 57.80 FT

WELL MATERIAL: [x] PVC [ ] SS [ ] ______

WELL LOCKED? [x] YES [ ] NO

WELL DIA. [x] 2 INCH [ ] 4 INCH [ ] 6 INCH [ ] ______

WATER LEVEL EQUIP USED: [x] ELECT. COND. PROBE [ ] FLOAT ACTIVATED [ ] PRESS. TRANSDUCER [ ] ______

HEIGHT OF WATER COLUMN: 10.76 FT x [x] .16 GAL/FT (2 IN.) [ ] .65 GAL/FT (4 IN.) [ ] 1.5 GAL/FT (6 IN.) [ ] ___ GAL/FT (___ IN.) = 1.72 GAL/VOL

3 TOTAL GAL PURGED

WELL INTEGRITY: YES / NO
- PROT. CASING SECURE: [x] YES [ ] NO
- CONCRETE COLLAR INTACT: [x] YES [ ] NO
- OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR: PURGING / SAMPLING)

PURGING	SAMPLING	EQUIPMENT	EQUIPMENT I.D.
[ ]	[ ]	PERISTALTIC PUMP	
[ ]	[ ]	SUBMERSIBLE PUMP	
[x]	[x]	BAILER	
[ ]	[ ]	PVC/SILICON TUBING	
[ ]	[ ]	TEFLON/SILICON TUBING	
[ ]	[ ]	AIR LIFT	
[ ]	[ ]	HAND PUMP	
	[ ]	IN-LINE FILTER	
	[ ]	PRESS/VAC FILTER	
[ ]	[ ]	______	

DECONTAMINATION METHOD: Steam Clean Bailer SS + Teflon SS wire

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM

FIELD DATA COLLECTED: [ ] IN-LINE [x] IN CONTAINER

PURGE DATA	@ 10 GAL	@ 20 GAL	@ 31 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	6.9	6.9	6.8		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1600	1600	1600		

SAMPLE OBSERVATIONS: [ ] TURBID [ ] COLORED [x] CLOUDY [ ] CLEAR [ ] ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	

NOTES:

SIGNATURE OF SAMPLER [signature]

James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD PHASE I RI | JOB NO.: 2573CC41 | DATE: 6/6/90

SAMPLE LOCATION I.D.: TNT-07-MWA | LOCATION ACTIVITY START: 1110 END: 1240

WATER LEVEL / WELL DATA

WELL DEPTH: 68.74 FT — ☒ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☒ TOP OF CASING ☐ ____ — CASING STICK-UP (FROM GROUND): 1.1 FT

WATER DEPTH: 57.54 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ____

WELL LOCKED? ☒ YES ☐ NO

WELL DIA: 2 INCH, 4 INCH, 6 INCH, ____

WATER LEVEL EQUIP USED: ☒ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ____

HEIGHT OF WATER COLUMN: 11.17 FT × ☒ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.79 GAL/VOL; 35 TOTAL GAL PURGED

WELL INTEGRITY: YES / NO
PROT. CASING SECURE ☒ YES
CONCRETE COLLAR INTACT ☒ YES
OTHER ____

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☒	☐	SUBMERSIBLE PUMP	
☒	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	____	

DECONTAMINATION METHOD: Steam Clean Bailers (teflon + SS) SS - ?e

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM — WELL MOUTH ____ PPM — FIELD DATA COLLECTED: ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 3 GAL	@ 10 GAL	@ 20 GAL	@ 35 GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	6.6	7.0	7.0	7.0	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	1000	1000	1000	

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☒ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER: [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: S140 PHASE I - 21 | JOB NO.: 2573004 | DATE: 6/6/96

SAMPLE LOCATION I.D.: TNT-07-MWB | LOCATION ACTIVITY: START: 1008 END: 1055

WATER LEVEL / WELL DATA

WELL DEPTH: 103.57 FT — [x] MEASURED [ ] HISTORICAL — [ ] TOP OF WELL [x] TOP OF CASING [ ] ____

CASING STICK-UP (FROM GROUND): 2.4 FT

WATER DEPTH: 58.70 FT

WELL MATERIAL: [x] PVC [ ] SS [ ] ____

WELL LOCKED? [x] YES [ ] NO

WELL DIA.: [ ] 2 INCH [x] 4 INCH [ ] 6 INCH [ ] ____

WATER LEVEL EQUIP. USED: [x] ELECT. COND. PROBE [ ] FLOAT ACTIVATED [ ] PRESS. TRANSDUCER [ ] ____

HEIGHT OF WATER COLUMN: 44.87 FT × [ ] .16 GAL/FT (2 IN.) [x] .65 GAL/FT (4 IN.) [ ] 1.5 GAL/FT (6 IN.) [ ] ___ GAL/FT (___ IN.) = 29.17 GAL/VOL

300 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE: [x] YES
CONCRETE COLLAR INTACT: [x] YES
OTHER ____

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
[ ]	[ ]	PERISTALTIC PUMP	
[x]	[ ]	SUBMERSIBLE PUMP	
[ ]	[x]	BAILER	
[ ]	[ ]	PVC/SILICON TUBING	
[ ]	[ ]	TEFLON/SILICON TUBING	
[ ]	[ ]	AIR LIFT	
[ ]	[ ]	HAND PUMP	
	[ ]	IN-LINE FILTER	
	[ ]	PRESS/VAC FILTER	
[ ]	[ ]	____	

DECONTAMINATION METHOD: Steam Clean Bailer Pump hoses

FIELD ANALYSIS DATA

AMBIENT AIR VOA: ____ PPM | WELL MOUTH: ____ PPM

FIELD DATA COLLECTED: [ ] IN-LINE [x] IN CONTAINER

PURGE DATA	@ 20 GAL	@ 180 GAL	@ 300 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	7.0	6.6	6.5		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	1000	1000		

SAMPLE OBSERVATIONS: [ ] TURBID [ ] COLORED [ ] CLOUDY [x] CLEAR [ ] ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	

NOTES:

SIGNATURE OF SAMPLER: [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PAGE \ OF ____

PROJECT 5140 PHASE I RI/FS JOB NO. 2573.0041 DATE 6/6/90

SAMPLE LOCATION I.D. TNT-07-MW LOCATION ACTIVITY START: 0830 END: 1005

WATER LEVEL / WELL DATA

WELL DEPTH 141.46 FT [x] MEASURED [ ] HISTORICAL [ ] TOP OF WELL [x] TOP OF CASING [ ] ____ CASING STICK-UP (FROM GROUND) 3.0 FT

WATER DEPTH 59.35 FT

WELL MATERIAL: [x] PVC [ ] SS [ ] ____

WELL LOCKED? [x] YES [ ] NO

WELL DIA. [ ] 2 INCH [x] 4 INCH [ ] 6 INCH [ ] ____

WATER LEVEL EQUIP USED [x] ELECT COND PROBE [ ] FLOAT ACTIVATED [ ] PRESS. TRANSDUCER [ ] ____

HEIGHT OF WATER COLUMN 82.11 FT X [ ] .16 GAL/FT (2 IN.) [x] .65 GAL/FT (4 IN.) [ ] 1.5 GAL/FT (6 IN.) [ ] ___ GAL/FT (___ IN.) = 53.37 GAL/VOL; 400 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE [x]
CONCRETE COLLAR INTACT [x]
OTHER ____

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
[ ]	[ ]	PERISTALTIC PUMP	
[x]	[ ]	SUBMERSIBLE PUMP	
[ ]	[x]	BAILER	
[ ]	[ ]	PVC/SILICON TUBING	
[ ]	[ ]	TEFLON/SILICON TUBING	
[ ]	[ ]	AIR LIFT	
[ ]	[ ]	HAND PUMP	
	[ ]	IN-LINE FILTER	
	[ ]	PRESS/VAC FILTER	
[ ]	[ ]		

DECONTAMINATION METHOD: Steam Clean Bailer Pump Hoses

FIELD ANALYSIS DATA

AMBIENT AIR VOA — PPM WELL MOUTH — PPM

FIELD DATA COLLECTED [ ] IN-LINE [x] IN CONTAINER

PURGE DATA	@ 20 GAL	@ 180 GAL	@ 300 GAL	@ 400 GAL	@ ___ GAL
TEMPERATURE, DEG C	—				
pH, units	6.6	6.7	6.7	6.7	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	1000	1000	1000	

SAMPLE OBSERVATIONS
[ ] TURBID
[ ] COLORED
[ ] CLOUDY
[x] CLEAR
[ ] ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT	SIAD PHASE 1 RI	JOB NO.	2573 C041	DATE	6/7/90
SAMPLE LOCATION I.D.	TNT-08-MWA	LOCATION ACTIVITY	START: 1930	END: 2100	

WATER LEVEL / WELL DATA

WELL DEPTH: 68.65 FT — ☒ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☒ TOP OF CASING ☐ ____ — CASING STICK-UP (FROM GROUND): 3.5 FT

WATER DEPTH: 58.96 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ____

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☒ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ____

WATER LEVEL EQUIP USED: ☒ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ____

HEIGHT OF WATER COLUMN: 9.69 FT x ☒ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.55 GAL/VOL

6 TOTAL GAL PURGED

WELL INTEGRITY	YES	NO
PROT. CASING SECURE	✓	
CONCRETE COLLAR INTACT	✓	
OTHER ____		

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:	✓ IF USED FOR: PURGING	SAMPLING	EQUIPMENT I.D.
PERISTALTIC PUMP	☐	☐	
SUBMERSIBLE PUMP	☐	☐	
BAILER	☒	☒	
PVC/SILICON TUBING	☐	☐	
TEFLON/SILICON TUBING	☐	☐	
AIR LIFT	☐	☐	
HAND PUMP	☐	☐	
IN-LINE FILTER		☐	
PRESS/VAC FILTER		☐	
____	☐	☐	

DECONTAMINATION METHOD: Steam Clean Bailers + wire

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM — WELL MOUTH ____ PPM — FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 1 GAL	@ 5 GAL	@ 6 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	7.0	7.0	7.0		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	890	940	1000		

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☒ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD PHASE I RI | JOB NO. 2573.0041 | DATE 6.6.90

SAMPLE LOCATION I.D. TNT-Ø9-MWA | LOCATION ACTIVITY START: 1550 END: 1630

WATER LEVEL / WELL DATA

WELL DEPTH 66.91 FT — ☒ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☒ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND) 2.5 FT

WATER DEPTH 57.54 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ______

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☒ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP. USED: ☒ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 9.37 FT × ☒ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.5 GAL/VOL

8 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☒ ☐
CONCRETE COLLAR INTACT ☒ ☐
OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☒	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Steam Clean Bailers SS-2

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM — WELL MOUTH ____ PPM — FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 3 GAL	@ 4 GAL	@ 8 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C / pH, units	7.0	7.0	7.0		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	970	960	960		

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☒ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD PHASE 1 RI/FS — JOB NO. 2573 0041 — DATE 6/3/90

SAMPLE LOCATION I.D. TNT-10-MWA — LOCATION ACTIVITY START: 1158 END: 1400

WATER LEVEL / WELL DATA

WELL DEPTH: 68.81 FT — ☒ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☒ TOP OF CASING ☐ ________ — CASING STICK-UP (FROM GROUND): 3.5 FT

WATER DEPTH: 59.83 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ________

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☒ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ________

WATER LEVEL EQUIP USED: ☒ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ________

HEIGHT OF WATER COLUMN: 8.98 FT × ☒ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.44 GAL/VOL; 30 TOTAL GAL PURGED

WELL INTEGRITY: YES / NO
PROT. CASING SECURE: ☒ YES
CONCRETE COLLAR INTACT: ☒ YES
OTHER ________

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR:)

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☒	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	________	

DECONTAMINATION METHOD: STEAM CLEAN BAILERS SS-WIRE

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM — WELL MOUTH ____ PPM — FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 2 GAL	@ 10 GAL	@ 28 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	7.2	7.1	7.3		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	1000	1000		

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☒ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER ________

James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD PHASE 1 RI/FS JOB NO. 2573CC41 DATE 6/3/90

SAMPLE LOCATION I.D. TNT-16-MWB LOCATION ACTIVITY START: 1105 END: 1150

WATER LEVEL / WELL DATA

WELL DEPTH: 101.97 FT — [X] MEASURED [ ] HISTORICAL — [ ] TOP OF WELL [X] TOP OF CASING [ ] ____

CASING STICK-UP (FROM GROUND): 2.3 FT

WATER DEPTH: 59.45 FT

WELL MATERIAL: [X] PVC [ ] SS [ ] ____

WELL LOCKED? [X] YES [ ] NO

WELL DIA. [ ] 2 INCH [X] 4 INCH [ ] 6 INCH [ ] ____

WATER LEVEL EQUIP. USED: [X] ELECT COND PROBE [ ] FLOAT ACTIVATED [ ] PRESS. TRANSDUCER [ ] ____

HEIGHT OF WATER COLUMN: 45.52 FT × [ ] .16 GAL/FT (2 IN.) [X] .65 GAL/FT (4 IN.) [ ] 1.5 GAL/FT (6 IN.) [ ] ___ GAL/FT (___ IN.) = 27.64 GAL/VOL

275 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE
CONCRETE COLLAR INTACT
OTHER ____

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR:

PURGING	SAMPLING		EQUIPMENT I.D.
[ ]	[ ]	PERISTALTIC PUMP	
[X]	[ ]	SUBMERSIBLE PUMP	
[ ]	[X]	BAILER	
[ ]	[ ]	PVC/SILICON TUBING	
[ ]	[ ]	TEFLON/SILICON TUBING	
[ ]	[ ]	AIR LIFT	
[ ]	[ ]	HAND PUMP	
	[ ]	IN-LINE FILTER	
	[ ]	PRESS/VAC FILTER	
[ ]	[ ]		

DECONTAMINATION METHOD: Steam Clean Pump Bailer Hoses

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM FIELD DATA COLLECTED [ ] IN-LINE [X] IN CONTAINER

PURGE DATA	@ 10 GAL	@ 60 GAL	@ 100 GAL	@ 275 GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	6.4	6.0	6.1	6.0	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	1000	1000	1000	

SAMPLE OBSERVATIONS: [ ] TURBID [ ] COLORED [X] CLOUDY [X] CLEAR [ ] ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	

NOTES:

SIGNATURE OF SAMPLER: [signature]

James M. Montgomery
Consulting Engineers, Inc.

PROJECT: S/AO PHASE 1 RI/FS | JOB NO.: 2573.0041 | DATE: 6/3/90

SAMPLE LOCATION I.D.: TNT-10-MWC | LOCATION ACTIVITY START: 0830 END: 1050

WATER LEVEL / WELL DATA

WELL DEPTH: 138.1 FT — ☒ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☒ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND): 2.9 FT

WATER DEPTH: 59.24 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ______

WELL LOCKED? ☒ YES ☐ NO

WELL DIA.: ☐ 2 INCH ☒ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP USED: ☒ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 78.86 FT x ☐ .16 GAL/FT (2 IN.) ☒ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 51.26 GAL/VOL

400 TOTAL GAL PURGED

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☒	☐
CONCRETE COLLAR INTACT	☒	☐
OTHER ______	☐	☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☒	☒	SUBMERSIBLE PUMP	
☐	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD:
Steam Clean
Bailer
Pump
Hoses

FIELD ANALYSIS DATA

AMBIENT AIR VOA: — PPM | WELL MOUTH: — PPM | FIELD DATA COLLECTED: ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 10 GAL	@ 50 GAL	@ 150 GAL	@ 300 GAL	@ 400 GAL
TEMPERATURE, DEG C					
pH, units	7.2	7.9	6.6	6.6	6.6
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	960	1000	920	920	920

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☐ CLOUDY ☒ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER: [signature]

James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD PHASE I RI | JOB NO. 2573 CC41 | DATE 6/7/92

SAMPLE LOCATION I.D. TUT-1-MW 4 | LOCATION ACTIVITY START: 1570 END: 1745

WATER LEVEL / WELL DATA

WELL DEPTH 74.28 FT — ☒ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☒ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND) 1.6 FT

WATER DEPTH 61.05 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ______

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☒ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP USED: ☒ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN 13.23 FT × ☒ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 2.12 GAL/VOL

37 TOTAL GAL PURGED

WELL INTEGRITY	YES	NO
PROT. CASING SECURE	☒	☐
CONCRETE COLLAR INTACT	☒	☐
OTHER ______	☐	☐

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR:)

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☒	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD: Steam Clean Bailer Onsite

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM | WELL MOUTH ____ PPM | FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 2 GAL	@ 10 GAL	@ 30 GAL	@ 37 GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	7.0	7.0	7.1	7.0	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1800	1700	1700	1800	

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☒ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT	SIAD PHASE I RI	JOB NO.	2573 0041	DATE	6/7/96
SAMPLE LOCATION I.D.	TUT-12-MW4	LOCATION ACTIVITY	START: 1120	END: 1315	

WATER LEVEL / WELL DATA

WELL DEPTH: 60.22 FT — ☒ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☒ TOP OF CASING ☐ ____

CASING STICK-UP (FROM GROUND): 2.2 FT

WATER DEPTH: 52.84 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ____

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☒ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ____

WATER LEVEL EQUIP USED: ☒ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ____

HEIGHT OF WATER COLUMN: 7.38 FT × ☒ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.18 GAL/VOL

8 TOTAL GAL PURGED

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☒	
CONCRETE COLLAR INTACT	☒	
OTHER ____		

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED.

✓ IF USED FOR:

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☒	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam Clean Bailer Ssure

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 3 GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	7.1				
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	720				

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☒ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT SIAD JOB NO. 2573.2040 DATE 6/7/90

SAMPLE LOCATION I.D. TNT 3 MWA LOCATION ACTIVITY START: 1755 END: 1920

WATER LEVEL / WELL DATA

WELL DEPTH 69.24 FT ☒ MEASURED ☐ HISTORICAL ☐ TOP OF WELL ☒ TOP OF CASING ☐ ____ CASING STICK-UP (FROM GROUND) ____ FT

WATER DEPTH 58.48 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ____

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☒ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ____

WATER LEVEL EQUIP. USED: ☒ ELECT COND PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ____

HEIGHT OF WATER COLUMN 10.76 FT x ☒ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 1.72 GAL/VOL

Dewatered well vol = 30 gal TOTAL GAL PURGED

WELL INTEGRITY: YES NO
PROT. CASING SECURE ☒ ☐
CONCRETE COLLAR INTACT ☒ ☐
OTHER ____

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☒	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐		

DECONTAMINATION METHOD: Steam cleaned bailers & flow valve wire

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 1 GAL	@ 20 GAL	@ 30 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	7.4	7.3	6.8		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	960	960		

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☒ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	/ / /
☐				☐	/ / /
☐				☐	/ / /
☐				☐	/ / /
☐				☐	/ / /
☐				☐	/ / /
☐				☐	/ / /
☐				☐	/ / /

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD PHASE I 21 | JOB NO. 2573 0041 | DATE 6/3/90

SAMPLE LOCATION I.D.: TNT-14-MW A | LOCATION ACTIVITY START: 1530 END: 1840

WATER LEVEL / WELL DATA

WELL DEPTH: 65.12 FT — ☒ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☒ TOP OF CASING ☐ ______ — CASING STICK-UP (FROM GROUND): 1.0 FT

WATER DEPTH: 49.80 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ______

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☒ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ______

WATER LEVEL EQUIP. USED: ☒ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ______

HEIGHT OF WATER COLUMN: 15.32 FT × ☒ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 2.45 GAL/VOL

41 TOTAL GAL PURGED

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☒	
CONCRETE COLLAR INTACT	☒	
OTHER ______		

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☒	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	______	

DECONTAMINATION METHOD:
Steam Clean
Teflon Bailer
SS Bailer
SS wire.

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM — WELL MOUTH ____ PPM — FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	● 5 GAL	● 20 GAL	● 40 GAL	● ___ GAL	● ___ GAL
TEMPERATURE, DEG C					
pH, units	7.0	6.6	6.8		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	1000	1000		

SAMPLE OBSERVATIONS
☐ TURBID
☐ COLORED
☒ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	/
☐				☐	/
☐				☐	/
☐				☐	/
☐				☐	/
☐				☐	/
☐				☐	/
☐				☐	/

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PROJECT: SIAD PHASE I RI/FS JOB NO. 2573.0041 DATE 6/2/90

SAMPLE LOCATION I.D. TNT-16-MWA LOCATION ACTIVITY START: 1125 END: 1308

WATER LEVEL / WELL DATA

WELL DEPTH 71.88 FT
- [x] MEASURED
- [ ] HISTORICAL
- [ ] TOP OF WELL
- [x] TOP OF CASING
- [ ] ______

CASING STICK-UP (FROM GROUND) 1.8 FT

WATER DEPTH 58.75 FT

WELL MATERIAL:
- [x] PVC
- [ ] SS
- [ ] ______

WELL LOCKED?
- [x] YES
- [ ] NO

WELL DIA.
- [ ] 2 INCH
- [x] 4 INCH
- [ ] 6 INCH
- [ ] ______

WATER LEVEL EQUIP. USED
- [x] ELECT.COND.PROBE
- [ ] FLOAT ACTIVATED
- [ ] PRESS. TRANSDUCER
- [ ] ______

HEIGHT OF WATER COLUMN 13.13 FT
X
- [ ] .16 GAL/FT (2 IN.)
- [x] .65 GAL/FT (4 IN.)
- [ ] 1.5 GAL/FT (6 IN.)
- [ ] ___ GAL/FT (___ IN.)

= 8.53 GAL/VOL

160 TOTAL GAL PURGED

WELL INTEGRITY: YES NO
- PROT. CASING SECURE: YES
- CONCRETE COLLAR INTACT: YES
- OTHER ______

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: ✓ IF USED FOR:

PURGING	SAMPLING		EQUIPMENT I.D.
[ ]	[ ]	PERISTALTIC PUMP	
[x]	[ ]	SUBMERSIBLE PUMP	
[ ]	[x]	BAILER	
[ ]	[ ]	PVC/SILICON TUBING	
[ ]	[ ]	TEFLON/SILICON TUBING	
[ ]	[ ]	AIR LIFT	
[ ]	[ ]	HAND PUMP	
	[ ]	IN-LINE FILTER	
	[ ]	PRESS/VAC FILTER	
[ ]	[ ]	______	

DECONTAMINATION METHOD: Steam Clean Pump, Bailer Hoses

FIELD ANALYSIS DATA

AMBIENT AIR VOA ____ PPM WELL MOUTH ____ PPM

FIELD DATA COLLECTED
- [ ] IN-LINE
- [x] IN CONTAINER

PURGE DATA	10 GAL	50 GAL	100 GAL	160 GAL	___ GAL
TEMPERATURE, DEG C					
pH, units	6.8	6.6	7.3	7.2	
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1000	1000	1000	1000	

SAMPLE OBSERVATIONS
- [ ] TURBID
- [ ] COLORED
- [x] CLOUDY
- [ ] CLEAR
- [ ] ODOR

SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
[ ]				[ ]	/ /
[ ]				[ ]	/ /
[ ]				[ ]	/ /
[ ]				[ ]	/ /
[ ]				[ ]	/ /
[ ]				[ ]	/ /
[ ]				[ ]	/ /
[ ]				[ ]	/ /

NOTES:

SIGNATURE OF SAMPLER [signature]

JMM James M. Montgomery
Consulting Engineers, Inc.

PAGE 1 OF ___

PROJECT: SIAD PHASE 1 R1 | JOB NO. 2573 0041 | DATE 6/2/92

SAMPLE LOCATION I.D. TNT-15MW A | LOCATION ACTIVITY START: 1320 END: 1500

WATER LEVEL / WELL DATA

WELL DEPTH: 71.25 FT — ☒ MEASURED ☐ HISTORICAL — ☐ TOP OF WELL ☒ TOP OF CASING ☐ ___

CASING STICK-UP (FROM GROUND): 2.4 FT

WATER DEPTH: 54.63 FT

WELL MATERIAL: ☒ PVC ☐ SS ☐ ___

WELL LOCKED? ☒ YES ☐ NO

WELL DIA. ☐ 2 INCH ☒ 4 INCH ☐ 6 INCH ☐ ___

WATER LEVEL EQUIP. USED: ☒ ELECT. COND. PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER ☐ ___

HEIGHT OF WATER COLUMN: 16.62 FT × ☐ .16 GAL/FT (2 IN.) ☒ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ___ GAL/FT (___ IN.) = 10.80 GAL/VOL

47 TOTAL GAL PURGED

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	✓	
CONCRETE COLLAR INTACT	✓	
OTHER ___		

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR:)

PURGING	SAMPLING		EQUIPMENT I.D.
☐	☐	PERISTALTIC PUMP	
☒	☐	SUBMERSIBLE PUMP	
☐	☒	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	TEFLON/SILICON TUBING	
☐	☐	AIR LIFT	
☐	☐	HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	
☐	☐	___	

DECONTAMINATION METHOD: Steam Clean Bailer Pump Hoses

FIELD ANALYSIS DATA

AMBIENT AIR VOA ___ PPM WELL MOUTH ___ PPM

FIELD DATA COLLECTED ☐ IN-LINE ☒ IN CONTAINER

PURGE DATA	@ 39 GAL	@ 40 GAL	@ 47 GAL	@ ___ GAL	@ ___ GAL
TEMPERATURE, DEG C					
pH, units	6.7	6.8	6.8		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	1400	1400	1400		

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☒ CLOUDY ☐ CLEAR ☐ ODOR

SAMPLE COLLECTION REQUIREMENTS

(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	✓ IF FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE I.D.'S
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	
☐				☐	

NOTES:

SIGNATURE OF SAMPLER: [signature]

Appendix J

Land Survey Data

JMM James M. Montgomery
Consulting Engineers Inc.

TABLE J-1

LAND SURVEY DATA
MONITORING WELL LOCATIONS AND ELEVATIONS

Well Number	Coordinates*		Elevation**
ALF-01-MWA	304504.567 N	2525117.952 E	4080.02
ALF-02-MWA	304057.763 N	2523896.817 E	4078.54
ALF-03-MWA	302896.271 N	2524736.532 E	4087.39
CCB-01-MWA	306151.574 N	2524664.786 E	4067.76
CCB-02-MWA	305215.678 N	2524516.586 E	4075.67
DMO-03-MWA	303742.865 N	2528129.764 E	4085.40
DMO-04-MWA	303578.791 N	2528027.429 E	4085.41
DMO-05-MWA	303338.121 N	2528087.794 E	4084.25
DSB-01-MWA	344400.442 N	2506267.987 E	3996.29
DSB-02-MWA	329658.793 N	3516081.364 E	4002.29
DSB-04-MWA	325655.829 N	2525802.389 E	4009.28
DSB-06-MWA	309661.704 N	2527171.419 E	4044.33
TNT-01-MWA	309893.728 N	2527032.313 E	4044.61
TNT-01-MWB	309883.468 N	2527033.442 E	4045.41
TNT-01-MWC	309873.126 N	2527033.130 E	4044.21
TNT-02-MWA	310188.088 N	2527656.303 E	4043.05
TNT-02-MWB	310179.713 N	2527654.934 E	4042.95
TNT-02-MWC	310168.593 N	2527653.566 E	4043.17
TNT-03-MWA	310320.910 N	2527311.930 E	4042.57
TNT-04-MWA	309901.321 N	2527657.510 E	4043.10
TNT-05-MWA	309391.870 N	2527998.456 E	4047.41
TNT-06-MWA	309667.021 N	2527338.992 E	4044.29
TNT-07-MWA	310320.457 N	2526872.422 E	4043.83
TNT-07-MWB	310321.094 N	2526882.055 E	4044.83
TNT-07-MWC	310324.911 N	2526896.823 E	4045.14
TNT-08-MWA	309892.691 N	2526712.055 E	4045.91
TNT-09-MWA	309562.610 N	2526780.449 E	4044.77
TNT-10-MWA	309623.837 N	2526116.021 E	4046.47
TNT-10-MWB	309626.062 N	2526127.072 E	4045.25
TNT-10-MBC	309637.563 N	2526128.343 E	4044.73
TNT-11-MWA	309438.992 N	2525933.389 E	4047.85
TNT-12-MWA	309887.666 N	2526066.235 E	4039.18
TNT-13-MWA	309608.557 N	2526552.871 E	4045.40
TNT-14-MWA	309953.728 N	2525470.719 E	4036.90
TNT-15-MWA	310409.421 N	2587688.949 E	4039.55
TNT-16-MWA	310406.116 N	2528134.451 E	4044.91
LF-A-MW	308061.481 N	2513813.665 E	4020.44
LF-B-MW	308332.399 N	2513357.943 E	4017.04
LF-C-MW	308868.170 N	2511744.438 E	4011.18

TABLE J-1 (Continued)

LAND SURVEY DATA
MONITORING WELL LOCATIONS AND ELEVATIONS

Well Number	Coordinates*		Elevation**
LF-D-MW	309023.034 N	2513885.281 E	4014.45
LF-E-MW	308698.622 N	2573989.418 E	4016.51
LF-F-MW	308085.422 N	2515003.648 E	4022.37
LF-G-MW	307317.079 N	2514019.234 E	4022.62
LF-H-MW	307633.915 N	2514106.031 E	4022.48
LF-I-MW	306467.855 N	2515561.719 E	4022.75
LF-J-MW	306659.491 N	2514341.309 E	4024.64
LF-K-MW	305456.887 N	2514865.851 E	4023.38
LF-L-MW	307367.760 N	2512738.726 E	4020.37
LF-M-MW	308868.170 N	2511744.438 E	4010.03
LF-N-MW	309135.883 N	2515591.187 E	4016.02
LF-O-MW	306029.595 N	2517424.767 E	4030.60
LF-1-MW	307042.312 N	2515124.375 E	4024.38
LF-2-MW	308293.152 N	2514128.450 E	4019.62
LBG-1-MW	344312.362 N	2530847.759 E	4011.43
LBG-2-MW	339349.749 N	2525553.715 E	4006.25
P-1-MW	302435.811 N	2523751.716 E	4086.45
P-2-MW	302431.882 N	2523637.031 E	4086.20
P-3-MW	302298.537 N	2523690.769 E	4086.14
DF-1-MW	309252.820 N	2526525.753 E	4086.82

* California State Plane Coordinates
** Top of PVC casing elevation, feet above mean sea level

TABLE J-2

LAND SURVEY DATA
SOIL BORING LOCATIONS AND ELEVATIONS

Well Number	Coordinates*				Elevation**
ALF-01-SB	303009.381	N	2525436.011	E	4081.00
ALF-02-SB	304146.639	N	2524645.244	E	4077.03
ALF-03-SB	304141.276	N	2525284.355	E	4077.87
ALF-04-SB	304077.326	N	2524806.352	E	4077.88
CCB-01-SB	305938.798	N	2524616.885	E	4066.42
CCB-02-SB	305780.565	N	2524598.015	E	4068.12
CCB-03-SB	305599.121	N	2524631.686	E	4071.33
CCB-04-SB	305029.048	N	2524659.961	E	4076.66
CCB-05-SB	304450.501	N	2524982.320	E	4076.98
DMO-06-SB	303658.901	N	2328105.724	E	4082.80
DMO-07-SB	303615.858	N	2528110.664	E	4083.02
DMO-08-SB	303553.051	N	2528120.492	E	4082.50
DMO-09-SB	303498.582	N	2528114.706	E	4082.47
DMO-10-SB	303663.159	N	2528232.117	E	4082.43
DMO-11-SB	303623.412	N	2528234.975	E	4082.25
DMO-12-SB	303693.457	N	2528270.733	E	4082.90
DMO-13-SB	303617.739	N	2528287.343	E	4082.80
DSB-01-SB	344467.331	N	2506259.269	E	3993.49
DSB-02-SB	329566.370	N	2516070.479	E	4000.27
DSB-03-SB	339415.945	N	2525689.278	E	4003.84
DSB-04-SB	325657.442	N	2525792.586	E	4006.97
DSB-05-SB	300987.501	N	2517749.046	E	4105.51
DSB-06-SB	309679.540	N	2527096.071	E	4042.01
TNT-07-SB	309485.659	N	2525945.351	E	4044.54
TNT-08-SB	309448.747	N	2526071.278	E	4047.24
TNT-09-SB	309474.306	N	2526125.735	E	4045.90
TNT-10-SB	309503.348	N	2526199.962	E	4044.15
TNT-11-SB	309589.823	N	2526162.990	E	4043.39
TNT-12-SB	310003.719	N	2527166.207	E	4038.08
TNT-13-SB	309990.217	N	2527192.222	E	4038.88
TNT-14-SB	309947.012	N	2527167.296	E	4039.07
TNT-15-SB	309959.865	N	2527142.820	E	4038.58
TNT-16-SB	309912.520	N	2527109.116	E	4039.48
TNT-17-SB	309898.452	N	2527129.095	E	4039.58
TNT-18-SB	309882.257	N	2527120.996	E	4040.20
TNT-19-SB	309895.843	N	2527100.367	E	4039.68

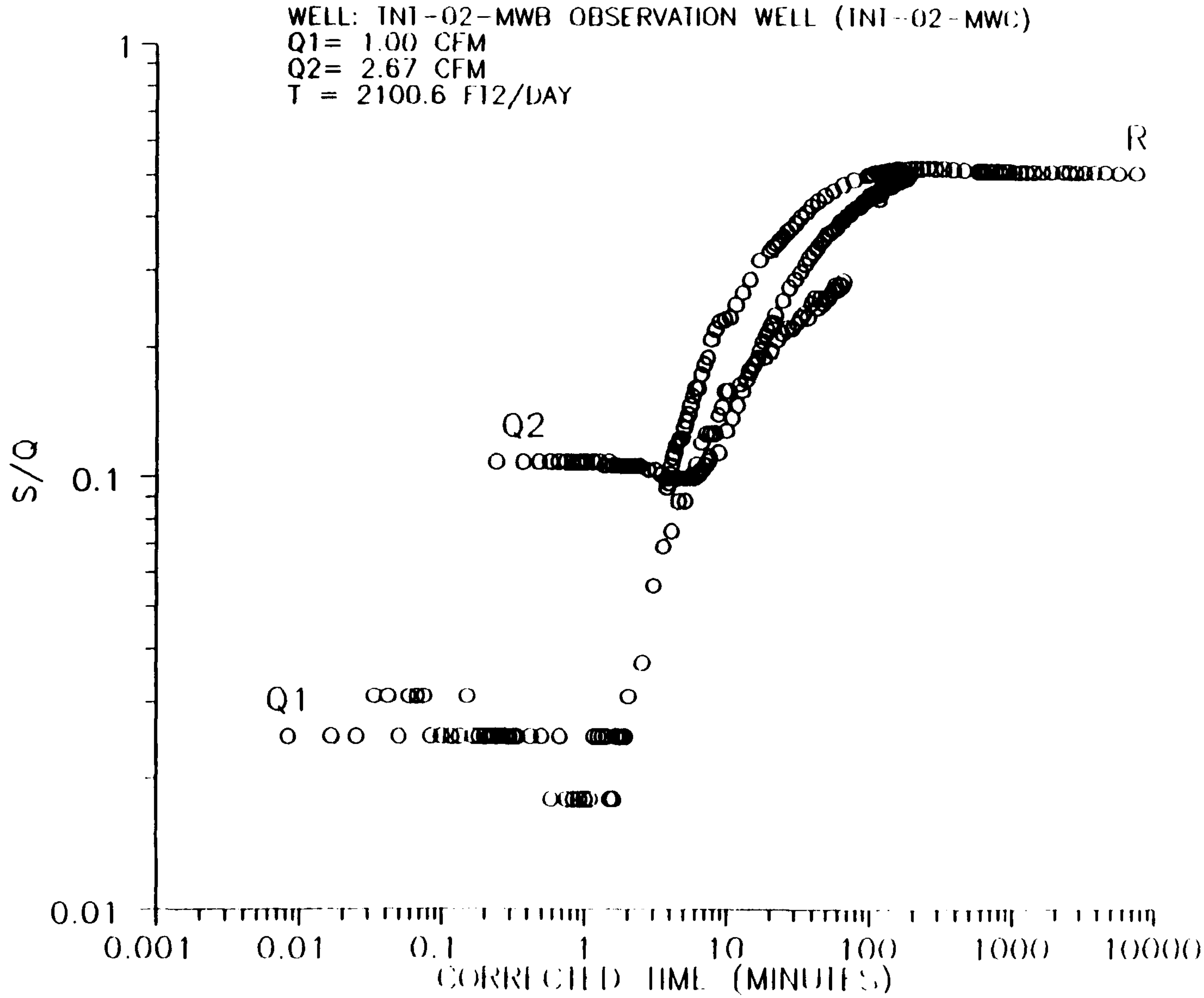
* California State Plane Coordinates

** Ground Surface Elevation, feet above Mean Sea Level

Appendix K

Basin-wide Flow Model at Honey Lake Valley

JMM James M. Montgomery
Consulting Engineers Inc.



WELL: TNT-02-MWB OBSERVATION WELL (TNT-02-MWC)
Q1= 1.00 CFM
Q2= 2.67 CFM
T = 2100.6 FT2/DAY
S/Q
1
0.1
0.01
0.001
0.01
0.1
1
10
100
1000
10000
CORRECTED TIME (MINUTES)
Q1
Q2
R

FN: ALF1MWA.PP.
PUMPING DAT' FOR WELL ALF-01-MWA

Step 0 04/10 13:25:03

Elapsed Time	INPUT 1
0.0000	0.247
0.0083	0.111
0.0166	0.080
0.0250	0.095
0.0333	0.116
0.0416	0.126
0.0500	0.126
0.0583	0.131
0.0666	0.151
0.0750	0.161
0.0833	0.156
0.1000	0.176
0.1166	0.176
0.1333	0.186
0.1500	0.191
0.1666	0.207
0.1833	0.202
0.2000	0.217
0.2166	0.212
0.2333	0.222
0.2500	0.227
0.2666	0.232
0.2833	0.227
0.3000	0.237
0.3166	0.232
0.3333	0.242
0.4166	0.247
0.5000	0.257
0.5833	0.257
0.6666	0.252
0.7500	0.262
0.8333	0.267
0.9166	0.257
1.0000	0.272
1.0833	0.272
1.1666	0.262
1.2500	0.267
1.3333	0.267
1.4166	0.277
1.5000	0.277
1.5833	0.272
1.6666	0.282
1.7500	0.272
1.8333	0.287
1.9166	0.277
2.0000	0.287
2.5000	0.293
3.0000	0.293
3.5000	0.287
4.0000	0.298
4.5000	0.308
5.0000	0.308

5.5000	0.298
6.0000	0.303
6.5000	0.293
7.0000	0.303
7.5000	0.298
8.0000	0.298
8.5000	0.303
9.0000	0.308
9.5000	0.308
10.0000	0.303
12.0000	0.323
14.0000	0.323
16.0000	0.323
18.0000	0.313
20.0000	0.308
22.0000	0.323
24.0000	0.323
26.0000	0.318
28.0000	0.313
30.0000	0.323
32.0000	0.318
34.0000	0.323
36.0000	0.318
38.0000	0.318
40.0000	0.318
42.0000	0.318
44.0000	0.318
46.0000	0.313
48.0000	0.313
50.0000	0.328
52.0000	0.313
54.0000	0.313
56.0000	0.308
58.0000	0.323
60.0000	0.323
62.0000	0.308
64.0000	0.313
66.0000	0.313
68.0000	0.313
70.0000	0.318
72.0000	0.308
74.0000	0.308
76.0000	0.318
78.0000	0.313
80.0000	0.313

END

FN: ALF2MWA.PRN
PUMPING DATA FOR WELL ALF-02-MWA

Step 0 04/11 14:55:36

Elapsed Time	INPUT 1
0.0000	-0.678
0.0083	0.489
0.0166	0.299
0.0250	0.489
0.0333	0.520
0.0416	0.584
0.0500	0.631
0.0583	0.694
0.0666	0.742
0.0750	0.773
0.0833	0.836
0.1000	0.915
0.1166	0.994
0.1333	1.073
0.1500	1.136
0.1666	1.199
0.1833	1.263
0.2000	1.310
0.2166	1.357
0.2333	1.420
0.2500	1.468
0.2666	1.515
0.2833	1.547
0.3000	1.594
0.3166	1.641
0.3333	1.673
0.4166	1.799
0.5000	1.910
0.5833	2.020
0.6666	2.099
0.7500	2.162
0.8333	2.226
0.9166	2.241
1.0000	2.305
1.0833	2.289
1.1666	2.305
1.2500	2.305
1.3333	2.320
1.4166	2.320
1.5000	2.336
1.5833	2.320
1.6666	2.368
1.7500	2.415
1.8333	2.478
1.9166	2.541
2.0000	2.573
2.5000	2.810
3.0000	2.952
3.5000	3.031
4.0000	3.078
4.5000	3.125
5.0000	3.141

5.5000	3.173
6.0000	3.189
6.5000	3.189
7.0000	3.236
7.5000	3.236
8.0000	3.268
8.5000	3.268
9.0000	3.252
9.5000	3.299
10.0000	3.315
12.0000	3.346
14.0000	3.394
16.0000	3.457
18.0000	3.473
20.0000	3.473
22.0000	3.504
24.0000	3.536
26.0000	3.536
28.0000	3.568
30.0000	3.583
32.0000	3.583
34.0000	3.599
36.0000	3.631
38.0000	3.615
40.0000	3.631
42.0000	3.678
44.0000	3.646
46.0000	3.662
48.0000	3.646
50.0000	3.678
52.0000	3.678
54.0000	3.678
56.0000	3.694
58.0000	3.694
60.0000	3.741
62.0000	3.710
64.0000	3.678
66.0000	3.741
68.0000	3.725
70.0000	3.741

END

FN: ALF3MWA.PRN
PUMPING DATA FOR WELL ALF-03-MWA

Step 0 04/11 10:48:19

Elapsed Time	INPUT 1
0.0000	0.599
0.0083	-0.410
0.0166	0.189
0.0250	0.347
0.0333	0.363
0.0416	0.394
0.0500	0.331
0.0583	0.394
0.0666	0.378
0.0750	0.363
0.0833	0.442
0.1000	0.363
0.1166	0.394
0.1333	0.442
0.1500	0.410
0.1666	0.442
0.1833	0.552
0.2000	0.489
0.2166	0.473
0.2333	0.505
0.2500	0.568
0.2666	0.489
0.2833	0.615
0.3000	0.615
0.3166	0.568
0.3333	0.599
0.4166	0.599
0.5000	0.694
0.5833	0.789
0.6666	0.852
0.7500	0.805
0.8333	0.868
0.9166	0.963
1.0000	0.899
1.0833	1.041
1.1666	0.963
1.2500	1.010
1.3333	1.089
1.4166	1.089
1.5000	1.120
1.5833	1.215
1.6666	1.120
1.7500	1.168
1.8333	1.215
1.9166	1.215
2.0000	1.326
2.5000	1.357
3.0000	1.484
3.5000	1.547
4.0000	1.436
4.5000	1.436
5.0000	1.484

5.5000	1.515
6.0000	1.389
6.5000	1.389
7.0000	1.420
7.5000	1.468
8.0000	1.452
8.5000	1.420
9.0000	1.452
9.5000	1.420
10.0000	1.499
12.0000	1.452
14.0000	1.484
16.0000	1.452
18.0000	1.436
20.0000	1.436
22.0000	1.531
24.0000	1.452
26.0000	1.452
28.0000	1.499
30.0000	1.468
32.0000	1.562
34.0000	1.562
36.0000	1.562
38.0000	1.562
40.0000	1.499
42.0000	1.578
44.0000	1.594
46.0000	1.499
48.0000	1.531
50.0000	1.547
52.0000	1.562
54.0000	1.562
56.0000	1.562
58.0000	1.594
60.0000	1.547
62.0000	1.515
64.0000	1.562
66.0000	1.610
68.0000	1.562
70.0000	1.562
72.0000	1.578
74.0000	1.578

END

FN: CCB1MWA.PRN
PUMPING DATA FOR WELL CCB-01-MWA

Step 0 04/09 12:24:50

Elapsed Time	INPUT 1	
0.001	3.86	4079.53
0.0083	3.98	4079.65
0.0166	3.89	4079.56
0.025	3.95	4079.62
0.0333	3.93	4079.6
0.0416	3.92	4079.59
0.05	3.89	4079.56
0.0583	3.93	4079.6
0.0666	3.95	4079.62
0.075	3.9	4079.57
0.0833	3.98	4079.65
0.1	3.98	4079.65
0.1166	3.93	4079.6
0.1333	4.01	4079.68
0.15	3.95	4079.62
0.1666	4.11	4079.78
0.1833	4.01	4079.68
0.2	4	4079.67
0.2166	4.06	4079.73
0.2333	4.03	4079.7
0.25	4.06	4079.73
0.2666	4.04	4079.71
0.2833	4.09	4079.76
0.3	4.06	4079.73
0.3166	4.06	4079.73
0.3333	4.09	4079.76
0.4166	4.11	4079.78
0.5	4.12	4079.79
0.5833	4.14	4079.81
0.6666	4.12	4079.79
0.75	4.15	4079.82
0.8333	4.2	4079.87
0.9166	4.19	4079.86
1	4.17	4079.84
1.0833	4.22	4079.89
1.1666	4.2	4079.87
1.25	4.23	4079.9
1.3333	4.22	4079.89
1.4166	4.23	4079.9
1.5	4.23	4079.9
1.5833	4.19	4079.86
1.6666	4.28	4079.95
1.75	4.17	4079.84
1.8333	4.25	4079.92
1.9166	4.23	4079.9
2	4.25	4079.92
2.5	4.25	4079.92
3	4.3	4079.97
3.5	4.23	4079.9
4	4.34	4080.01
4.5	4.3	4079.97
5	4.28	4079.95

5.5	4.33	4080
6	4.25	4079.92
6.5	4.28	4079.95
7	4.3	4079.97
7.5	4.3	4079.97
8	4.31	4079.98
8.5	4.28	4079.95
9	4.28	4079.95
9.5	4.28	4079.95
10	4.31	4079.98
12	4.28	4079.95
14	4.33	4080
16	4.38	4080.05
18	4.26	4079.93
20	4.28	4079.95
22	4.38	4080.05
24	4.36	4080.03
26	4.38	4080.05
28	4.31	4079.98
30	4.38	4080.05
32	4.33	4080
34	4.31	4079.98
36	4.41	4080.08
38	4.38	4080.05
40	4.42	4080.09
42	4.41	4080.08
44	4.41	4080.08
46	4.34	4080.01
48	4.38	4080.05
50	4.41	4080.08
52	4.41	4080.08
54	4.34	4080.01
56	4.36	4080.03
58	4.39	4080.06
60	4.44	4080.11
62	4.38	4080.05
64	4.44	4080.11
66	4.44	4080.11
68	4.36	4080.03
70	4.38	4080.05
72	4.36	4080.03
74	4.31	4079.98

fn: CCB2MWA.PRN
PUMPING DATA FOR WELL CCB-02-MWA

Step 0 04/09 16:10:20

Elapsed Time	INPUT 1	
0	0.78	4076.45
0.0083	1.13	4076.8
0.0166	0.64	4076.31
0.025	0.67	4076.34
0.0333	0.72	4076.39
0.0416	0.69	4076.36
0.05	0.8	4076.47
0.0583	0.77	4076.44
0.0666	0.77	4076.44
0.075	0.8	4076.47
0.0833	0.92	4076.59
0.1	0.96	4076.63
0.1166	1.05	4076.72
0.1333	1.11	4076.78
0.15	1.11	4076.78
0.1666	1.22	4076.89
0.1833	1.26	4076.93
0.2	1.29	4076.96
0.2166	1.4	4077.07
0.2333	1.46	4077.13
0.25	1.48	4077.15
0.2666	1.52	4077.19
0.2833	1.62	4077.29
0.3	1.63	4077.3
0.3166	1.63	4077.3
0.3333	1.67	4077.34
0.4166	1.92	4077.59
0.5	2.15	4077.82
0.5833	2.23	4077.9
0.6666	2.33	4078
0.75	2.59	4078.26
0.8333	2.58	4078.25
0.9166	2.72	4078.39
1	2.86	4078.53
1.0833	2.97	4078.64
1.1666	3.1	4078.77
1.25	3.21	4078.88
1.3333	3.32	4078.99
1.4166	3.46	4079.13
1.5	3.51	4079.18
1.5833	3.51	4079.18
1.6666	3.6	4079.27
1.75	3.71	4079.38
1.8333	3.79	4079.46
1.9166	3.89	4079.56
2	3.87	4079.54
2.5	4.19	4079.86
3	4.45	4080.12
3.5	4.64	4080.31
4	4.82	4080.49
4.5	4.96	4080.63
5	5.01	4080.68

5.5	5.19	4080.86
6	5.19	4080.86
6.5	5.32	4080.99
7	5.4	4081.07
7.5	5.45	4081.12
8	5.45	4081.12
8.5	5.53	4081.2
9	5.56	4081.23
9.5	5.57	4081.24
10	5.65	4081.32
12	5.71	4081.38
14	5.84	4081.51
16	5.97	4081.64
18	6.03	4081.7
20	6.05	4081.72
22	6.12	4081.79
24	6.17	4081.84
26	6.2	4081.87
28	6.23	4081.9
30	6.27	4081.94
32	6.19	4081.86
34	6.25	4081.92
36	6.27	4081.94
38	6.2	4081.87
40	6.28	4081.95
42	6.33	4082
44	6.22	4081.89
46	6.3	4081.97
48	6.28	4081.95
50	6.34	4082.01
52	6.34	4082.01
54	6.39	4082.06
56	6.38	4082.05
58	6.47	4082.14
60	6.44	4082.11
62	6.38	4082.05
64	6.49	4082.16
66	6.38	4082.05

END

FN: DMO3MWA.PRN
PUMPING DATA FOR WELL DMO-03-MWA

t(MINUTES)	s(FT)
0.0083	-0.252
0.0166	-0.094
0.0250	0.410
0.0333	0.221
0.0416	0.221
0.0500	0.299
0.0583	0.299
0.0666	0.284
0.0750	0.315
0.0833	0.442
0.1000	0.378
0.1166	0.457
0.1333	0.489
0.1500	0.552
0.1666	0.505
0.1833	0.599
0.2000	0.584
0.2166	0.584
0.2333	0.615
0.2500	0.599
0.2666	0.694
0.2833	0.647
0.3000	0.710
0.3166	0.694
0.3333	0.647
0.4166	0.820
0.5000	0.852
0.5833	0.963
0.6666	1.041
0.7500	1.057
0.8333	1.152
0.9166	1.215
1.0000	1.278
1.0833	1.357
1.1666	1.420
1.2500	1.499
1.3333	1.499
1.4166	1.610
1.5000	1.673
1.5833	1.752
1.6666	1.784
1.7500	1.831
1.8333	1.989
1.9166	1.926
2.0000	2.005
2.5000	2.447
3.0000	2.810
3.5000	3.047
4.0000	3.362
4.5000	3.710
5.0000	3.946
5.5000	4.215
6.0000	4.578
6.5000	4.862

7.0000	5.178
7.5000	5.509
8.0000	5.825
8.5000	6.109
9.0000	6.362
9.5000	6.583
10.0000	6.836
12.0000	7.846
14.0000	8.777

END

FN: DMO3RMWA.WKQ
RECOVERY DATA FOR WELL DMO-03-MWA

Step 1 04/12 11:32:07

Elapsed Time INPUT 1

*RECOVERY BEGUN @ 14.88 MIN. ELAPSED TIME

FN= DMO3RMWA.DAT

t'	t	t/t'	s
0.0083	14.8883	1793.771	9.156
0.0166	14.8966	897.3855	9.141
0.025	14.905	596.2	9.125
0.0333	14.9133	447.8468	9.109
0.0416	14.9216	358.6923	9.093
0.05	14.93	298.6	9.093
0.0583	14.9383	256.2316	9.077
0.0666	14.9466	224.4234	9.077
0.075	14.955	199.4	9.062
0.0833	14.9633	179.6315	9.062
0.1	14.98	149.8	9.062
0.1166	14.9966	128.6158	9.046
0.1333	15.0133	112.6279	9.03
0.15	15.03	100.2	9.014
0.1666	15.0466	90.31573	9.014
0.1833	15.0633	82.1784	8.999
0.2	15.08	75.4	8.983
0.2166	15.0966	69.69806	8.967
0.2333	15.1133	64.78054	8.967
0.25	15.13	60.52	8.951
0.2666	15.1466	56.81395	8.935
0.2833	15.1633	53.52383	8.92
0.3	15.18	50.6	8.92
0.3166	15.1966	47.99937	8.904
0.3333	15.2133	45.64446	8.904
0.4166	15.2966	36.71771	8.841
0.5	15.38	30.76	8.793
0.5833	15.4633	26.51003	8.746
0.6666	15.5466	23.32223	8.699
0.75	15.63	20.84	8.651
0.8333	15.7133	18.85671	8.604
0.9166	15.7966	17.23391	8.556
1	15.88	15.88	8.509
1.0833	15.9633	14.73581	8.478
1.1666	16.0466	13.75501	8.414
1.25	16.13	12.904	8.383
1.3333	16.2133	12.16028	8.32
1.4166	16.2966	11.50402	8.288
1.5	16.38	10.92	8.241
1.5833	16.4633	10.39809	8.193
1.6666	16.5466	9.928357	8.146
1.75	16.63	9.502857	8.099
1.8333	16.7133	9.116511	8.067
1.9166	16.7966	8.763748	8.02
2	16.88	8.44	7.972
2.5	17.38	6.952	7.672
3	17.88	5.96	7.388
3.5	18.38	5.251429	7.136
4	18.88	4.72	6.883

4.5	19.38	4.306667	6.646
5	19.88	3.976	6.409
5.5	20.38	3.705455	6.188
6	20.88	3.48	5.967
6.5	21.38	3.289231	5.746
7	21.88	3.125714	5.478
7.5	22.38	2.984	5.209
8	22.88	2.86	4.988
8.5	23.38	2.750588	4.767
9	23.88	2.653333	4.562
9.5	24.38	2.566316	4.341
10	24.88	2.488	4.12
12	26.88	2.24	3.473
14	28.88	2.062857	2.983
16	30.88	1.93	2.541
18	32.88	1.826667	2.162
20	34.88	1.744	1.831
22	36.88	1.676364	1.547
24	38.88	1.62	1.31
26	40.88	1.572308	1.105
28	42.88	1.531429	0.915
30	44.88	1.496	0.773
32	46.88	1.465	0.647
34	48.88	1.437647	0.52
36	50.88	1.413333	0.426
38	52.88	1.391579	0.347
40	54.88	1.372	0.284
42	56.88	1.354286	0.236
44	58.88	1.338182	0.189
46	60.88	1.323478	0.142
48	62.88	1.31	0.11
50	64.88	1.2976	0.078
52	66.88	1.286154	0.047
54	68.88	1.275556	0.015
56	70.88	1.265714	0
58	72.88	1.256552	-0.015
60	74.88	1.248	-0.031
62	76.88	1.24	-0.063
64	78.88	1.2325	-0.078
66	80.88	1.225455	-0.094
68	82.88	1.218824	-0.094
70	84.88	1.212571	-0.11
72	86.88	1.206667	-0.142
74	88.88	1.201081	-0.142
76	90.88	1.195789	-0.142
78	92.88	1.190769	-0.157
80	94.88	1.186	-0.173

FN: DMO4RMWA.WKQ
RECOVERY DATA FOR WELL DMO-04-MWA

Step 1 04/12 11:32:07

Elapsed Time INPUT 1

*RECOVERY BEGUN @ 81.567 MIN. ELAPSED TIME

FN: DMO4RMWA.DAT

t'	t	t/t'	s
0.0083	81.5753	9828.349	9.156
0.0166	81.5836	4914.675	9.141
0.025	81.592	3263.68	9.125
0.0333	81.6003	2450.459	9.109
0.0416	81.6086	1961.745	9.093
0.05	81.617	1632.34	9.093
0.0583	81.6253	1400.091	9.077
0.0666	81.6336	1225.73	9.077
0.075	81.642	1088.56	9.062
0.0833	81.6503	980.1957	9.062
0.1	81.667	816.67	9.062
0.1166	81.6836	700.5455	9.046
0.1333	81.7003	612.9055	9.03
0.15	81.717	544.78	9.014
0.1666	81.7336	490.5978	9.014
0.1833	81.7503	445.9918	8.999
0.2	81.767	408.835	8.983
0.2166	81.7836	377.5789	8.967
0.2333	81.8003	350.6228	8.967
0.25	81.817	327.268	8.951
0.2666	81.8336	306.9527	8.935
0.2833	81.8503	288.9174	8.92
0.3	81.867	272.89	8.92
0.3166	81.8836	258.6342	8.904
0.3333	81.9003	245.7255	8.904
0.4166	81.9836	196.7921	8.841
0.5	82.067	164.134	8.793
0.5833	82.1503	140.8371	8.746
0.6666	82.2336	123.3627	8.699
0.75	82.317	109.756	8.651
0.8333	82.4003	98.88432	8.604
0.9166	82.4836	89.98865	8.556
1	82.567	82.567	8.509
1.0833	82.6503	76.29493	8.478
1.1666	82.7336	70.91857	8.414
1.25	82.817	66.2536	8.383
1.3333	82.9003	62.17678	8.32
1.4166	82.9836	58.57942	8.288
1.5	83.067	55.378	8.241
1.5833	83.1503	52.51708	8.193
1.6666	83.2336	49.94216	8.146
1.75	83.317	47.60971	8.099
1.8333	83.4003	45.4919	8.067
1.9166	83.4836	43.55818	8.02
2	83.567	41.7835	7.972
2.5	84.067	33.6268	7.672
3	84.567	28.189	7.388
3.5	85.067	24.30486	7.136
4	85.567	21.39175	6.883

4.5	86.067	19.126	6.646
5	86.567	17.3134	6.409
5.5	87.067	15.83036	6.188
6	87.567	14.5945	5.967
6.5	88.067	13.54877	5.746
7	88.567	12.65243	5.478
7.5	89.067	11.8756	5.209
8	89.567	11.19587	4.988
8.5	90.067	10.59612	4.767
9	90.567	10.063	4.562
9.5	91.067	9.586	4.341
10	91.567	9.1567	4.12
12	93.567	7.79725	3.473
14	95.567	6.826214	2.983
16	97.567	6.097937	2.541
18	99.567	5.5315	2.162
20	101.567	5.07835	1.831
22	103.567	4.707591	1.547
24	105.567	4.398625	1.31
26	107.567	4.137192	1.105
28	109.567	3.913107	0.915
30	111.567	3.7189	0.773
32	113.567	3.548969	0.647
34	115.567	3.399029	0.52
36	117.567	3.26575	0.426
38	119.567	3.1465	0.347
40	121.567	3.039175	0.284
42	123.567	2.942071	0.236
44	125.567	2.853795	0.189
46	127.567	2.773196	0.142
48	129.567	2.699313	0.11
50	131.567	2.63134	0.078
52	133.567	2.568596	0.047
54	135.567	2.5105	0.015
56	137.567	2.456554	0
58	139.567	2.406328	-0.015
60	141.567	2.35945	-0.031
62	143.567	2.315597	-0.063
64	145.567	2.274484	-0.078
66	147.567	2.235864	-0.094
68	149.567	2.199515	-0.094
70	151.567	2.165243	-0.11
72	153.567	2.132875	-0.142
74	155.567	2.102257	-0.142
76	157.567	2.07325	-0.142
78	159.567	2.045731	-0.157
80	161.567	2.019588	-0.173
82	163.567	1.99472	-0.173

END

FN: DMO4MWA.PRN
PUMPING DATA FOR WELL DMO-04-MWA

Step 0 04/12 15:32:19

Elapsed Time	INPUT 1
0.0000	-0.363
0.0083	0.252
0.0166	0.394
0.0250	0.426
0.0333	0.378
0.0416	0.457
0.0500	0.568
0.0583	0.599
0.0666	0.536
0.0750	0.631
0.0833	0.726
0.1000	0.736
0.1166	0.852
0.1333	0.899
0.1500	0.931
0.1666	1.105
0.1833	1.089
0.2000	1.184
0.2166	1.341
0.2333	1.357
0.2500	1.484
0.2666	1.578
0.2833	1.578
0.3000	1.610
0.3166	1.815
0.3333	1.752
0.4166	2.068
0.5000	2.289
0.5833	2.368
0.6666	2.526
0.7500	2.904
0.8333	2.936
0.9166	3.031
1.0000	3.189
1.0833	3.315
1.1666	3.552
1.2500	3.583
1.3333	3.725
1.4166	3.946
1.5000	4.041
1.5833	4.183
1.6666	4.294
1.7500	4.373
1.8333	4.373
1.9166	4.436
2.0000	4.420
2.5000	4.688
3.0000	4.720
3.5000	4.688
4.0000	4.594
4.5000	4.483
5.0000	4.420

5.5000	4.420
6.0000	4.515
6.5000	4.388
7.0000	4.483
7.5000	4.483
8.0000	4.436
8.5000	4.357
9.0000	4.420
9.5000	4.436
10.0000	4.404
12.0000	4.452
14.0000	4.610
16.0000	4.610
18.0000	4.673
20.0000	4.752
22.0000	4.878
24.0000	4.815
26.0000	4.799
28.0000	4.704
30.0000	4.941
32.0000	4.941
34.0000	4.957
36.0000	4.973
38.0000	4.941
40.0000	4.925
42.0000	4.973
44.0000	4.973
46.0000	4.909
48.0000	4.894
50.0000	5.036
52.0000	5.052
54.0000	5.004
56.0000	5.020
58.0000	4.941
60.0000	4.988
62.0000	5.020
64.0000	5.020
66.0000	5.004
68.0000	5.036
70.0000	5.004
72.0000	4.957
74.0000	5.052
76.0000	5.004
78.0000	4.988
80.0000	4.957

END

FN: TNT16MWA.PRN
PUMPING DATA FOR WELL TNT-16-MWA

Step 0 04/13 11:44:36

Elapsed Time	INPUT 1
0.0000	0.742
0.0083	0.489
0.0166	0.236
0.0250	0.157
0.0333	0.142
0.0416	0.189
0.0500	0.252
0.0583	0.284
0.0666	0.315
0.0750	0.284
0.0833	0.315
0.1000	0.363
0.1166	0.457
0.1333	0.505
0.1500	0.552
0.1666	0.552
0.1833	0.584
0.2000	0.631
0.2166	0.710
0.2333	0.710
0.2500	0.789
0.2666	0.884
0.2833	0.884
0.3000	0.884
0.3166	0.947
0.3333	1.010
0.4166	1.152
0.5000	1.326
0.5833	1.531
0.6666	1.657
0.7500	1.894
0.8333	2.005
0.9166	2.099
1.0000	2.241
1.0833	2.383
1.1666	2.494
1.2500	2.589
1.3333	2.762
1.4166	2.778
1.5000	2.968
1.5833	3.078
1.6666	3.189
1.7500	3.268
1.8333	3.425
1.9166	3.520
2.0000	3.583
2.5000	3.978
3.0000	4.436
3.5000	4.831
4.0000	5.036
4.5000	5.320
5.0000	5.636

5.5000	5.778
6.0000	6.046
6.5000	6.173
7.0000	6.299
7.5000	6.425
8.0000	6.615
8.5000	6.630
9.0000	6.693
9.5000	6.851
10.0000	6.836
12.0000	7.088
14.0000	7.214
16.0000	7.341
18.0000	7.483
20.0000	7.514
22.0000	7.514
24.0000	7.593
26.0000	7.641
28.0000	7.783
30.0000	7.688
32.0000	7.735
34.0000	7.814
36.0000	7.767
38.0000	7.814
40.0000	7.893
42.0000	7.862
44.0000	7.925
46.0000	7.846
48.0000	7.909
50.0000	7.893
52.0000	7.972
54.0000	7.957
56.0000	7.925
58.0000	8.035
60.0000	8.035
62.0000	7.988
64.0000	7.925
66.0000	8.035
68.0000	8.051
70.0000	8.020
72.0000	7.988
74.0000	8.020
76.0000	7.941
78.0000	8.020
80.0000	8.004
82.0000	8.099
84.0000	8.051
86.0000	8.099
88.0000	8.083

END

FN: TNT16R.WKQ
RECOVERY DATA FOR WELL TNT16MWA

Step 1 04/13 13:12:58

Elapsed Time INPUT 1

RECOVERY STARTED AT 28.4 MINUTES

T'	T	T/T'	s
0.0083	28.4083	3422.687	7.941
0.0166	28.4166	1711.843	7.893
0.025	28.425	1137	7.846
0.0333	28.4333	853.8529	7.799
0.0416	28.4416	683.6923	7.751
0.05	28.45	569	7.704
0.0583	28.4583	488.1355	7.672
0.0666	28.4666	427.4264	7.625
0.075	28.475	379.6667	7.593
0.0833	28.4833	341.9364	7.546
0.1	28.5	285	7.483
0.1166	28.5166	244.5678	7.42
0.1333	28.5333	214.0533	7.357
0.15	28.55	190.3333	7.309
0.1666	28.5666	171.4682	7.246
0.1833	28.5833	155.9373	7.199
0.2	28.6	143	7.151
0.2166	28.6166	132.1173	7.104
0.2333	28.6333	122.7317	7.072
0.25	28.65	114.6	7.025
0.2666	28.6666	107.5266	6.993
0.2833	28.6833	101.2471	6.946
0.3	28.7	95.66667	6.899
0.3166	28.7166	90.7031	6.851
0.3333	28.7333	86.20852	6.804
0.4166	28.8166	69.17091	6.599
0.5	28.9	57.8	6.394
0.5833	28.9833	49.6885	6.173
0.6666	29.0666	43.60426	5.967
0.75	29.15	38.86667	5.762
0.8333	29.2333	35.08136	5.541
0.9166	29.3166	31.98407	5.304
1	29.4	29.4	5.115
1.0833	29.4833	27.21619	4.957
1.1666	29.5666	25.34425	4.799
1.25	29.65	23.72	4.657
1.3333	29.7333	22.30053	4.515
1.4166	29.8166	21.048	4.278
1.5	29.9	19.93333	4.136
1.5833	29.9833	18.93722	3.962
1.6666	30.0666	18.04068	3.836
1.75	30.15	17.22857	3.725
1.8333	30.2333	16.49119	3.552
1.9166	30.3166	15.81791	3.362
2	30.4	15.2	3.173
2.5	30.9	12.36	2.336
3	31.4	10.46667	1.815
3.5	31.9	9.114286	1.357
4	32.4	8.1	1.01

4.5	32.9	7.311111	0.726
5	33.4	6.68	0.52
5.5	33.9	6.163636	0.378
6	34.4	5.733333	0.252
6.5	34.9	5.369231	0.157
7	35.4	5.057143	0.078
7.5	35.9	4.786667	0.031
8	36.4	4.55	-0.015
8.5	36.9	4.341176	-0.047
9	37.4	4.155556	-0.078
9.5	37.9	3.989474	-0.11
10	38.4	3.84	-0.126
12	40.4	3.366667	-0.157
14	42.4	3.028571	-0.173
16	44.4	2.775	-0.189
18	46.4	2.577778	-0.205
20	48.4	2.42	-0.205
22	50.4	2.290909	-0.205
24	52.4	2.183333	-0.205
26	54.4	2.092308	-0.205
28	56.4	2.014286	-0.205
30	58.4	1.946667	-0.221
32	60.4	1.8875	-0.221
34	62.4	1.835294	-0.221
36	64.4	1.788889	-0.221
38	66.4	1.747368	-0.221
40	68.4	1.71	-0.221
42	70.4	1.67619	-0.221
44	72.4	1.645455	-0.221
46	74.4	1.617391	-0.221
48	76.4	1.591667	-0.221
50	78.4	1.568	-0.221
52	80.4	1.546154	-0.221
54	82.4	1.525926	-0.221
56	84.4	1.507143	-0.236
58	86.4	1.489655	-0.236
60	88.4	1.473333	-0.221
62	90.4	1.458065	-0.221
64	92.4	1.44375	-0.236
66	94.4	1.430303	-0.221
68	96.4	1.417647	-0.236
70	98.4	1.405714	-0.236
72	100.4	1.394444	-0.236
74	102.4	1.383784	-0.236
76	104.4	1.373684	-0.236
78	106.4	1.364103	-0.236
80	108.4	1.355	-0.236
82	110.4	1.346341	-0.236
84	112.4	1.338095	-0.236

FN: TNT1B.PRN: TNT-01-MWB STEP-TEST
2
0.836,0.945
0,118.9,122.08

STEP 1 5/9 17:01:53 (0 MIN ELAPSED)

2=1B-PROD.
3=1B-OBS1.

T ELAPSED	INPUT 1	INPUT 2	INPUT 3	INPUT 4	
0.0083	0.063	-0.693	0	0.012	
0.0166	0.063	0.819	0	0.012	
0.025	0.063	0.299	0	0.012	
0.0333	0.063	0.504	0	0.018	
0.0416	0.094	0.677	0	0.012	
0.05	0.094	0.709	0	0.018	
0.0583	0.094	0.866	0	0.018	
0.0666	0.094	0.945	0	0.012	
0.075	0.094	1.055	0	0.018	
0.0833	0.094	1.15	0	0.018	
0.1	0.063	1.355	0	0.018	
0.1166	0.063	1.575	0	0.012	
0.1333	0.063	1.764	0	0.018	
0.15	0.063	1.953	0	0.018	
0.1666	0.063	2.158	0	0.012	
0.1833	0.063	2.347	0	0.018	
0.2	0.063	2.552	0	0.018	
0.2166	0.063	2.725	0	0.018	
0.2333	0.063	2.93	0	0.018	
0.25	0.063	3.119	0	0.018	
0.2666	0.063	3.308	0	0.018	
0.2833	0.063	3.497	0	0.018	
0.3	0.063	3.671	0	0.018	
0.3166	0.063	3.876	0	0.018	
0.3333	0.063	4.049	0	0.018	
0.4166	0.063	4.947	0	0.018	
0.5	0.031	5.798	0	0.018	
0.5833	0.063	6.649	0	0.018	
0.6666	0.063	7.468	0	0.018	
0.75	0.031	8.224	0	0.018	
0.8333	0.063	8.981	0	0.025	
0.9166	0.063	9.69	0	0.025	
1	0.063	10.399	0	0.025	
1.0833	0.063	11.013	0	0.018	
1.1666	0.063	11.738	0	0.018	
1.25	0.063	12.352	0	0.018	
1.3333	0.063	12.951	0	0.012	
1.4166	0.063	13.534	-0.006	0.018	
1.5	0.063	14.133	0	0.018	
1.5833	0.063	14.716	0	0.018	
1.6666	0.063	15.267	-0.006	0.018	
1.75	0.063	15.803	-0.006	0.037	
1.8333	0.063	16.339	-0.006	0.012	
1.9166	0.063	16.843	-0.006	0.006	
2	0.063	17.347	-0.006	0	
2.5	0.063	20.23	-0.012	-0.006	
3	0.031	22.751	-0.012	-0.006	
3.5	0.031	24.957	-0.018	0	
4	0.031	26.832	-0.018	-0.006	
4.5	0.031	28.455	-0.012	0	

5	0.063	29.889	-0.012	0.006
5.5	0.031	31.134	-0.018	0.012
6	0.031	32.174	-0.018	0.006
6.5	0.063	33.072	-0.018	0

7	0.063	33.749	-0.018	0
7.5	0.063	33.828	-0.018	0.006
8	0.063	33.907	-0.018	0.006
8.5	0.031	34.049	-0.018	0.006
9	0.063	34.143	-0.018	0
9.5	0.031	34.222	-0.018	0.012
10	0.063	34.285	-0.018	0
12	0.031	34.427	-0.025	-0.006
14	0.063	34.348	-0.018	0.012
16	0.031	34.127	-0.012	0
18	0.031	33.954	-0.018	-0.006
20	0.031	33.859	-0.012	0
22	0.031	33.828	-0.012	0.018
24	0	33.812	-0.012	0
26	0.031	33.781	-0.012	0.006
28	0	33.749	-0.012	0.012
30	0	33.733	-0.012	0.006
32	0	33.859	-0.006	0.006
34	0.031	33.954	-0.006	0.018
36	0	34.127	-0.006	0.012
38	0	34.364	-0.012	0.006
40	0	34.474	-0.018	0
42	0	34.553	-0.018	-0.006
44	0	34.238	-0.012	0.012
46	0	33.67	-0.012	0.006
48	0	32.914	-0.006	0.012
50	0	32.331	-0.012	0.012
52	0	31.827	-0.006	0.012
54	0	31.386	-0.006	0.006
56	0	31.071	-0.012	0
58	0	30.882	-0.012	0.006
60	0	30.787	-0.025	-0.006
62	0	30.74	-0.018	0
64	0	30.724	-0.018	0
66	0	30.724	-0.025	-0.006
68	0	30.708	-0.012	0.012
70	0	30.692	-0.012	0.012
72	0	30.708	-0.012	0.006
74	0	30.677	-0.018	0.012
76	0	30.614	-0.012	0.006
78	0	30.362	-0.018	0
80	0	30.125	-0.025	-0.012
82	0	29.999	-0.025	0
84	0	29.92	-0.031	-0.012
86	0	29.857	-0.031	-0.006
88	0	29.842	-0.025	0
90	0	29.826	-0.018	0.006

92	0	29.842	-0.025	-0.006
94	0	29.857	-0.018	0
96	0	29.873	-0.018	0
98	0	29.826	-0.025	-0.006
100	0	29.81	-0.025	-0.006
105	0	29.873	-0.018	0
110	0	29.857	-0.018	0.006
115	0	29.889	-0.018	0

STEP 3 5/9 19:00:01 (118.9 MIN ELAPSED)

T ELAPSED	INPUT 1	2	3	4
118.9083	0.031	29.889	-0.018	0.006
118.9166	0.063	29.889	-0.018	0.006
118.925	0.063	29.889	-0.018	0.006
118.9333	0.094	29.889	-0.018	0.006
118.9416	0.094	29.889	-0.018	0.006
118.95	0.094	29.889	-0.018	0.006
118.9583	0.094	29.889	-0.018	0.006
118.9666	0.094	29.889	-0.018	0.006
118.975	0.094	29.905	-0.018	0.006
118.9833	0.094	29.889	-0.018	0.006
119	0.094	29.889	-0.018	0.006
119.0166	0.063	29.889	-0.018	0.006
119.0333	0.063	29.889	-0.018	0.006
119.05	0.063	29.889	-0.018	0.006
119.0666	0.063	29.889	-0.018	0.006
119.0833	0.063	29.889	-0.018	0.006
119.1	0.063	29.889	-0.018	0.006
119.1166	0.063	29.889	-0.018	0.006
119.1333	0.063	29.905	-0.018	0.006
119.15	0.063	29.889	-0.018	0.006
119.1666	0.063	29.905	-0.018	0.006
119.1833	0.094	29.889	-0.018	0.006
119.2	0.063	29.889	-0.018	0
119.2166	0.063	29.889	-0.018	0.006
119.2333	0.094	29.889	-0.018	0.006
119.3166	0.063	30.094	-0.018	0.006
119.4	0.063	30.598	-0.018	0
119.4833	0.063	31.071	-0.018	0.006
119.5666	0.063	31.48	-0.018	0.006
119.65	0.063	31.906	-0.018	0
119.7333	0.063	32.3	-0.018	0
119.8166	0.063	32.678	-0.018	0
119.9	0.063	33.04	-0.018	0
119.9833	0.063	33.371	-0.025	0
120.0666	0.063	33.639	-0.025	0.006
120.15	0.063	33.828	-0.018	-0.012
120.2333	0.063	33.97	-0.025	-0.006
120.3166	0.063	34.096	-0.031	-0.012

120.4	0.063	34.238	-0.025	-0.006
120.4833	0.063	34.364	-0.025	-0.006
120.5666	0.063	34.474	-0.031	-0.012
120.65	0.063	34.6	-0.025	-0.018
120.7333	0.063	34.695	-0.031	-0.006
120.8166	0.063	34.805	-0.031	-0.006
120.9	0.063	34.931	-0.031	-0.012
121.4	0.063	35.12	-0.031	-0.012
121.9	0.063	35.12	-0.025	-0.006

STEP 2 5/9 19:03:12 (122.08 MIN ELAPSED)

ELAPSED T	INPUT 1	INPUT 2	INPUT 3	INPUT 4
122.0883	0.094	35.12	-0.025	-0.006
122.0966	0.126	35.104	-0.025	-0.006
122.105	0.126	35.104	-0.025	-0.012
122.1133	0.126	35.104	-0.025	-0.006
122.1216	0.126	35.104	-0.025	0
122.13	0.126	35.104	-0.025	-0.006
122.1383	0.126	35.104	-0.025	-0.006
122.1466	0.126	35.104	-0.025	-0.006
122.155	0.126	35.104	-0.025	-0.006
122.1633	0.126	35.104	-0.025	-0.006
122.18	0.094	35.104	-0.025	-0.006
122.1966	0.094	35.041	-0.025	-0.006
122.2133	0.094	34.962	-0.025	-0.006
122.23	0.094	34.836	-0.025	-0.006
122.2466	0.094	34.742	-0.025	-0.006
122.2633	0.094	34.647	-0.025	-0.012
122.28	0.094	34.553	-0.025	-0.006
122.2966	0.094	34.474	-0.025	-0.006
122.3133	0.094	34.379	-0.025	-0.006
122.33	0.094	34.301	-0.025	-0.006
122.3466	0.094	34.206	-0.025	-0.012
122.3633	0.094	34.127	-0.025	-0.006
122.38	0.094	34.049	-0.025	-0.006
122.3966	0.094	33.954	-0.025	-0.006
122.4133	0.094	33.875	-0.025	-0.006
122.4966	0.063	33.466	-0.025	-0.006
122.58	0.094	32.867	-0.025	-0.006
122.6633	0.063	32.221	-0.025	0
122.7466	0.063	31.575	-0.025	-0.012
122.83	0.094	30.945	-0.025	-0.006
122.9133	0.094	30.314	-0.025	-0.006
122.9966	0.063	29.7	-0.025	0
123.08	0.063	29.101	-0.025	-0.012
123.1633	0.063	28.502	-0.025	-0.012
123.2466	0.094	27.935	-0.025	-0.006
123.33	0.063	27.368	-0.025	-0.006
123.4133	0.094	26.816	-0.031	-0.012

123.4966	0.094	26.281	-0.025	-0.006
123.58	0.094	25.761	-0.031	-0.006
123.6633	0.094	25.241	-0.025	-0.006
123.7466	0.094	24.737	-0.025	-0.006
123.83	0.094	24.232	-0.025	-0.006
123.9133	0.094	23.744	-0.025	-0.006
123.9966	0.094	23.256	-0.025	-0.006
124.08	0.094	22.767	-0.025	-0.006
124.58	0.094	20.073	-0.025	-0.006
125.08	0.094	17.694	-0.025	-0.006
125.58	0.094	15.472	-0.018	0
126.08	0.094	13.581	-0.018	0.006
126.58	0.094	11.911	-0.018	0
127.08	0.094	10.446	-0.018	0.006
127.58	0.094	9.201	-0.018	0
128.08	0.094	7.988	-0.018	0.006
128.58	0.094	6.979	-0.018	0
129.08	0.094	6.097	-0.018	0
129.58	0.094	5.309	-0.018	0
130.08	0.094	4.616	-0.018	0
130.58	0.094	4.002	-0.012	0.006
131.08	0.094	3.466	-0.012	0.006
131.58	0.094	3.009	-0.018	-0.006
132.08	0.094	2.599	-0.031	-0.018
134.08	0.094	1.402	-0.018	-0.006
136.08	0.063	0.661	-0.031	-0.018
138.08	0.094	0.236	-0.018	0.006

FN: TNT1C.PRN
WELL TNT-01-MWC STEP-TEST DATA
2
0.757,2.23
0,58.93,227.38
STEP 1 5/9/90 10:22:30 (0 ELAPSED)

T ELAPSED	1CPROD INPUT 1	1COBS.STP 2	3	4
0.0083	0.22	0.015	0	0.018
0.0166	0.252	0.015	0	0.018
0.025	0.347	0.015	0	0.018
0.0333	0.441	0.015	0	0.018
0.0416	0.536	0.015	0	0.018
0.05	0.631	0.015	0	0.018
0.0583	0.725	0.015	0	0.018
0.0666	0.789	0.015	0	0.018
0.075	0.852	0.015	0	0.018
0.0833	0.915	0.015	0	0.018
0.1	0.946	0.015	0	0.018
0.1166	0.978	0.031	0	0.018
0.1333	1.041	0.015	0	0.018
0.15	1.073	0.015	0	0.018
0.1666	1.104	0.015	0	0.018
0.1833	1.104	0.015	0	0.018
0.2	1.136	0.015	0	0.018
0.2166	1.136	0.015	0	0.018
0.2333	1.136	0.031	0	0.018
0.25	1.167	0.015	0	0.018
0.2666	1.136	0.015	0	0.018
0.2833	1.167	0.015	0	0.018
0.3	1.167	0.015	0	0.018
0.3166	1.167	0.015	0	0.018
0.3333	1.199	0.015	0	0.018
0.4166	1.104	0.015	0	0.018
0.5	1.073	0.015	0	0.018
0.5833	1.073	0.015	0	0.018
0.6666	1.041	0.015	0	0.018
0.75	1.01	0.015	0	0.018
0.8333	1.01	0.015	0	0.018
0.9166	1.01	0.015	0	0.018
1	1.01	0.015	0	0.018
1.0833	1.01	0.015	0	0.018
1.1666	1.041	0.015	0	0.018
1.25	1.041	0.015	0	0.018
1.3333	1.041	0.015	0	0.018
1.4166	1.041	0.015	0	0.012
1.5	1.041	0.015	0	0.012
1.5833	1.01	0.015	0	0.012
1.6666	1.01	0.015	0	0.012
1.75	1.041	0.015	0	0.012
1.8333	1.01	0.015	0	0.012
1.9166	1.041	0.015	0	0.012
2	1.01	0.015	0	0.012
2.5	0.946	0.015	0	0.012
3	0.915	0.015	-0.006	0.012
3.5	0.883	0.015	-0.006	0.006
4	0.915	0.015	-0.006	0.012
4.5	0.915	0.015	-0.006	0.012

5	0.946	0.015	-0.006	0.018
5.5	0.946	0.015	-0.006	0.018
6	0.915	0.015	-0.006	0.018
6.5	-1.041	0.015	-0.006	0.025
7	-1.01	0.015	-0.006	0.025
7.5	-1.073	0.015	-0.006	0.025
8	-1.041	0.015	-0.006	0.025
8.5	-1.01	0.015	-0.006	0.018
9	-0.978	0	-0.006	0.006
9.5	-0.978	0	-0.006	0.012
10	-0.915	0.015	-0.006	0.012
12	-0.946	0	-0.006	0.012
14	-0.946	0	-0.006	0.012
16	-0.915	0.015	-0.006	0.018
18	-0.946	0	-0.012	0.006
20	-0.915	0	-0.012	0.018
22	-0.978	0	-0.012	0.006
24	-0.978	0	-0.012	0.012
26	-0.915	0	-0.012	0.006
28	-0.978	0	-0.012	0
30	-0.978	0	-0.012	0.012
32	-1.01	0	-0.025	0
34	-0.946	0	-0.012	0.006
36	-0.978	0	-0.018	-0.006
38	-0.915	0	-0.012	0
40	-0.946	0	-0.006	0.006
42	-0.946	0	-0.018	0
44	-0.915	0.015	-0.018	0.012
46	-0.946	0.015	-0.018	-0.025
48	-0.915	0.015	-0.012	-0.006
50	-0.915	0.015	-0.018	0
52	-0.946	0.015	-0.018	-0.012
54	-0.915	0.015	-0.006	0.006
56	-0.915	0.015	-0.012	0
58	-0.915	0.015	-0.012	-0.018

STEP 2 5/9/90 11:21:26 (58.93 ELAPSED)

T ELAPSED	INPUT 1	2	3	4
58.9383	-0.757	0.015	-0.012	-0.018
58.9466	-0.284	0.015	-0.012	-0.006
58.955	-0.315	0.015	-0.012	0
58.9633	-0.41	0.015	-0.012	-0.018
58.9716	-0.347	0.015	-0.018	-0.012
58.98	-0.189	0.015	-0.018	-0.012
58.9883	-0.126	0.015	-0.012	-0.006
58.9966	0	0.015	-0.012	-0.018
59.005	0.126	0.015	-0.012	0
59.0133	0.22	0.015	-0.012	-0.018
59.03	0.347	0.015	-0.012	-0.018

59.0466	0.505	0.015	-0.012	-0.006
59.0633	0.631	0.015	-0.012	-0.006
59.08	0.725	0.015	-0.012	-0.018
59.0966	0.82	0.015	-0.012	-0.018
59.1133	0.915	0.015	-0.012	-0.018
59.13	0.946	0.015	-0.012	-0.012
59.1466	1.041	0.015	-0.012	-0.018
59.1633	1.073	0.015	-0.012	-0.006
59.18	1.136	0.015	-0.012	-0.018
59.1966	1.199	0.015	-0.012	-0.012
59.2133	1.199	0.015	-0.012	-0.012

59.23	1.262	0.031	-0.012	-0.018
59.2466	1.262	0.015	-0.012	-0.012
59.2633	1.294	0.015	-0.012	-0.006
59.3466	1.388	0.015	-0.012	-0.018
59.43	1.451	0.015	-0.012	-0.012
59.5133	1.483	0.015	-0.018	-0.012
59.5966	1.546	0.015	-0.018	-0.012
59.68	1.578	0.015	-0.018	-0.018
59.7633	1.578	0.015	-0.018	-0.012
59.8466	1.578	0.015	-0.018	-0.012
59.93	1.641	0.015	-0.018	-0.018
60.0133	1.641	0.015	-0.025	-0.012
60.0966	1.672	0.015	-0.025	-0.012
60.18	1.704	0.015	-0.025	-0.018
60.2633	1.735	0.015	-0.025	-0.018
60.3466	1.735	0.015	-0.025	-0.018
60.43	1.767	0.015	-0.025	-0.012
60.5133	1.799	0.015	-0.018	-0.012
60.5966	1.799	0.015	-0.018	-0.012
60.68	1.83	0.015	-0.018	-0.012
60.7633	1.83	0.015	-0.018	-0.012
60.8466	1.83	0.015	-0.018	-0.012
60.93	1.83	0.015	-0.018	-0.012
61.43	1.893	0.015	-0.025	-0.018
61.93	1.925	0.015	-0.025	-0.025
62.43	1.956	0.015	-0.018	-0.012
62.93	1.956	0	-0.025	-0.006
63.43	2.02	0	-0.025	-0.006
63.93	2.051	0	-0.025	-0.012
64.43	2.051	0	-0.025	-0.012
64.93	2.083	0	-0.025	-0.012
65.43	2.146	0.015	-0.018	0
65.93	2.146	0	-0.018	-0.006
66.43	2.177	0.015	-0.018	-0.006
66.93	2.177	0.015	-0.018	0
67.43	2.177	0	-0.037	-0.012
67.93	2.177	0	-0.031	-0.018
68.43	2.209	0	-0.031	-0.006
68.93	2.209	0.015	-0.031	-0.006
70.93	2.24	0	-0.037	-0.025

72.93	2.304	0.015	-0.025	-0.006
74.93	2.304	0	-0.025	-0.012
76.93	2.304	0.015	-0.025	0
78.93	2.335	0.015	-0.025	-0.018
80.93	2.304	0.015	-0.025	-0.018
82.93	2.367	0.015	-0.025	-0.006
84.93	2.367	0.015	-0.031	-0.012
86.93	2.367	0.015	-0.031	-0.018
88.93	2.398	0.015	-0.031	-0.025
90.93	2.398	0.015	-0.031	-0.018
92.93	2.398	0.031	-0.025	-0.018
94.93	2.43	0.031	-0.025	-0.012
96.93	2.43	0.031	-0.025	-0.012
98.93	2.398	0.031	-0.025	-0.006
100.93	2.43	0.031	-0.031	-0.018
102.93	2.43	0.031	-0.025	-0.012
104.93	2.398	0.031	-0.025	-0.018
106.93	2.43	0.031	-0.025	-0.018

108.93	2.43	0.031	-0.031	-0.018
110.93	2.43	0.047	-0.025	-0.012
112.93	2.43	0.047	-0.018	-0.012
114.93	2.43	0.047	-0.018	-0.012
116.93	2.43	0.047	-0.037	-0.025
118.93	2.43	0.047	-0.025	-0.012
120.93	2.461	0.047	-0.037	-0.037
122.93	2.43	0.047	-0.031	-0.025
124.93	2.461	0.047	-0.025	0
126.93	2.43	0.047	-0.025	-0.012
128.93	2.461	0.047	-0.031	-0.025
130.93	2.43	0.047	-0.031	-0.025
132.93	2.461	0.047	-0.031	-0.031
134.93	2.461	0.063	-0.025	-0.018
136.93	2.43	0.063	-0.031	-0.025
138.93	2.43	0.063	-0.037	-0.025
140.93	2.461	0.063	-0.025	-0.012
142.93	2.461	0.063	-0.018	-0.018
144.93	2.461	0.063	-0.018	-0.012
146.93	2.461	0.063	-0.018	-0.012
148.93	2.461	0.063	-0.025	-0.031
150.93	2.461	0.063	-0.031	-0.031
152.93	2.398	0.078	-0.044	-0.037
154.93	2.461	0.063	-0.037	-0.012
156.93	2.43	0.063	-0.031	-0.031
158.93	2.461	0.063	-0.031	-0.037
163.93	2.43	0.063	-0.031	-0.012
168.93	2.461	0.063	-0.031	-0.031
173.93	2.461	0.063	-0.031	-0.018
178.93	2.43	0.063	-0.037	-0.025
183.93	2.461	0.063	-0.031	-0.018
188.93	2.461	0.063	-0.025	-0.025
193.93	2.461	0.063	-0.031	-0.044

198.93	2.43	0.063	-0.031	-0.018
203.93	2.43	0.063	-0.031	-0.044
208.93	2.461	0.063	-0.031	-0.025
213.93	2.493	0.063	-0.037	-0.018
218.93	2.493	0.078	-0.031	-0.031
223.93	2.493	0.078	-0.031	-0.025

STEP 3 (RECOVERY) 5/9/90 14:09:53 (227.38 E

T ELAPSED	INPUT 1	2	3	4
227.3883	1.672	0.078	-0.031	-0.025
227.3966	2.02	0.078	-0.031	-0.025
227.405	2.02	0.078	-0.031	-0.018
227.4133	1.893	0.078	-0.031	-0.018
227.4216	1.672	0.094	-0.031	-0.018
227.43	1.483	0.094	-0.031	-0.018
227.4383	1.325	0.094	-0.025	-0.018
227.4466	1.167	0.094	-0.031	-0.025
227.455	1.041	0.094	-0.025	-0.018
227.4633	0.946	0.094	-0.025	-0.025
227.48	0.662	0.094	-0.025	-0.025
227.4966	0.441	0.094	-0.025	-0.025
227.5133	0.252	0.094	-0.025	-0.018
227.53	0.126	0.094	-0.025	-0.018
227.5466	0	0.094	-0.025	-0.018
227.5633	-0.094	0.094	-0.025	-0.018
227.58	-0.189	0.094	-0.025	-0.018
227.5966	-0.252	0.094	-0.025	-0.018
227.6133	-0.315	0.094	-0.025	-0.018
227.63	-0.378	0.094	-0.025	-0.018
227.6466	-0.441	0.094	-0.025	-0.018
227.6633	-0.473	0.094	-0.025	-0.018
227.68	-0.505	0.094	-0.025	-0.018
227.6966	-0.568	0.094	-0.025	-0.018
227.7133	-0.599	0.094	-0.025	-0.018
227.7966	-0.725	0.094	-0.025	-0.018
227.88	-0.82	0.094	-0.025	-0.018
227.9633	-0.883	0.094	-0.025	-0.018
228.0466	-0.946	0.094	-0.025	-0.025
228.13	-1.01	0.094	-0.025	-0.025
228.2133	-1.041	0.094	-0.025	-0.025
228.2966	-1.073	0.094	-0.025	-0.025
228.38	-1.104	0.094	-0.025	-0.031
228.4633	-1.136	0.094	-0.025	-0.025
228.5466	-1.167	0.094	-0.025	-0.025
228.63	-1.199	0.094	-0.025	-0.025
228.7133	-1.199	0.094	-0.025	-0.018
228.7966	-1.23	0.094	-0.025	-0.018
228.88	-1.23	0.094	-0.018	-0.018
228.9633	-1.23	0.094	-0.018	-0.018

229.0466	-1.262	0.094	-0.025	-0.018
229.13	-1.294	0.094	-0.025	-0.018
229.2133	-1.325	0.094	-0.031	-0.018
229.2966	-1.325	0.094	-0.031	-0.018
229.38	-1.357	0.094	-0.031	-0.025
229.88	-1.451	0.094	-0.031	-0.037
230.38	-1.483	0.094	-0.025	-0.031
230.88	-1.546	0.094	-0.031	-0.031
231.38	-1.609	0.094	-0.025	-0.044
231.88	-1.641	0.094	-0.031	-0.037
232.38	-1.704	0.094	-0.031	-0.044
232.88	-1.704	0.094	-0.025	-0.031
233.38	-1.767	0.094	-0.031	-0.037
233.88	-1.799	0.094	-0.031	-0.05
234.38	-1.799	0.094	-0.025	-0.031
234.88	-1.83	0.094	-0.025	-0.037
235.38	-1.862	0.094	-0.031	-0.031
235.88	-1.862	0.094	-0.025	-0.031
236.38	-1.893	0.094	-0.025	-0.031
236.88	-1.893	0.094	-0.025	-0.044
237.38	-1.925	0.094	-0.025	-0.05
239.38	-1.988	0.094	-0.025	-0.037
241.38	-2.051	0.094	-0.025	-0.031
243.38	-2.114	0.094	-0.031	-0.063
245.38	-2.146	0.094	-0.018	-0.025
247.38	-2.177	0.078	-0.031	-0.044
249.38	-2.209	0.078	-0.031	-0.056
251.38	-2.209	0.078	-0.031	-0.044
253.38	-2.24	0.078	-0.025	-0.037
255.38	-2.24	0.078	-0.025	-0.037
257.38	-2.272	0.078	-0.031	-0.031
259.38	-2.272	0.063	-0.031	-0.031
261.38	-2.304	0.063	-0.025	-0.031
263.38	-2.304	0.063	-0.031	-0.025
265.38	-2.304	0.063	-0.025	-0.05
267.38	-2.304	0.063	-0.031	-0.044
269.38	-2.335	0.047	-0.037	-0.05
271.38	-2.335	0.047	-0.031	-0.037
273.38	-2.335	0.047	-0.037	-0.025
275.38	-2.367	0.047	-0.031	-0.018
277.38	-2.367	0.047	-0.025	-0.037
279.38	-2.367	0.047	-0.044	-0.05

FN: TNT2B.PRN
WELL TNT-02-MWB STEP-TEST DATA
2
1.0,2.67
0,64.15,227.35

STEP 1 5/10/90 12:13:19 (0 ELAPSED)

T ELAPSED	INPUT 1	2B-PROD 2	2B-OBS3 3	4
0.0083	0.094	0.031	0.025	0.006
0.0166	0.094	0.283	0.025	0.012
0.025	0.094	0.393	0.025	0.012
0.0333	0.094	0.504	0.031	0.012
0.0416	0.094	0.614	0.031	0.012
0.05	0.094	0.709	0.025	0.012
0.0583	0.094	0.724	0.031	0.012
0.0666	0.094	0.819	0.031	0.012
0.075	0.094	0.866	0.031	0.006
0.0833	0.094	0.913	0.025	0.012
0.1	0.094	1.008	0.025	0.012
0.1166	0.063	1.071	0.025	0.012
0.1333	0.063	1.134	0.025	0.012
0.15	0.094	1.197	0.031	0.006
0.1666	0.063	1.244	0.025	0.006
0.1833	0.063	1.292	0.025	0.006
0.2	0.063	1.355	0.025	0.012
0.2166	0.063	1.402	0.025	0.006
0.2333	0.094	1.433	0.025	0.012
0.25	0.063	1.481	0.025	0.012
0.2666	0.094	1.496	0.025	0.006
0.2833	0.094	1.544	0.025	0.006
0.3	0.094	1.544	0.025	0.006
0.3166	0.094	1.591	0.025	0.006
0.3333	0.094	1.607	0.025	0.006
0.4166	0.063	1.701	0.025	0.006
0.5	0.063	1.764	0.025	0.006
0.5833	0.063	1.811	0.018	0.006
0.6666	0.063	1.843	0.025	0.012
0.75	0.063	1.874	0.018	0.012
0.8333	0.063	1.89	0.018	0.012
0.9166	0.063	1.922	0.018	0.012
1	0.063	1.938	0.018	0.012
1.0833	0.063	1.953	0.018	0.012
1.1666	0.063	1.969	0.025	0.012
1.25	0.063	1.985	0.025	0.012
1.3333	0.063	1.985	0.025	0.018
1.4166	0.063	2.001	0.025	0.018
1.5	0.063	2.016	0.018	0.018
1.5833	0.063	2.001	0.018	0.012
1.6666	0.063	2.001	0.025	0.012
1.75	0.063	2.016	0.025	0.006
1.8333	0.063	2.001	0.025	0.006
1.9166	0.063	2.032	0.025	0
2	0.063	2.016	0.031	0
2.5	0.063	1.78	0.037	0
3	0.063	1.717	0.056	0
3.5	0.063	1.67	0.069	0.006
4	0.063	1.67	0.075	0.006

4.5	0.063	1.685	0.088	0.006
5	0.063	1.827	0.088	-0.006
5.5	0.063	1.843	0.101	-0.006
6	0.063	1.859	0.107	0

6.5	0.063	1.764	0.12	0
7	0.063	1.607	0.126	0
7.5	0.063	1.591	0.126	-0.012
8	0.063	1.575	0.126	-0.012
8.5	0.063	1.591	0.139	-0.018
9	0.094	1.575	0.145	-0.012
9.5	0.094	1.575	0.158	-0.006
10	0.094	1.591	0.158	-0.006
12	0.063	1.591	0.164	0.012
14	0.063	1.622	0.177	0.006
16	0.094	1.622	0.189	0
18	0.063	1.638	0.189	-0.012
20	0.063	1.638	0.196	-0.006
22	0.063	1.638	0.208	0
24	0.063	1.654	0.215	-0.006
26	0.063	1.654	0.221	-0.006
28	0.063	1.67	0.221	-0.012
30	0.063	1.67	0.227	-0.006
32	0.063	1.67	0.234	0
34	0.063	1.685	0.24	0.012
36	0.063	1.685	0.234	-0.012
38	0.063	1.685	0.252	0.012
40	0.063	1.701	0.259	0.012
42	0.063	1.701	0.246	0.018
44	0.063	1.701	0.259	0.006
46	0.063	1.717	0.252	-0.006
48	0.063	1.717	0.259	0.006
50	0.063	1.717	0.259	-0.006
52	0.063	1.717	0.265	0
54	0.063	1.733	0.271	-0.006
56	0.063	1.733	0.278	0.006
58	0.063	1.733	0.271	-0.025
60	0.063	1.717	0.278	-0.012
62	0.063	1.733	0.278	0.012
64	0.063	1.67	0.284	0.012

STEP 2 5/10/90 13:17:28 (64.15 ELAPSED)

T ELAPSED	INPUT1	2	3	4
64.1583	0.094	2.064	0.29	0.012
64.1666	0.094	2.032	0.29	0.012
64.175	0.126	2.221	0.29	0.012
64.1833	0.126	2.379	0.29	0.006
64.1916	0.126	2.568	0.29	0.012
64.2	0.126	2.741	0.29	0.006
64.2083	0.126	2.914	0.29	0.006

64.2166	0.126	3.056	0.29	0.012
64.225	0.126	3.198	0.29	0.012
64.2333	0.126	3.34	0.29	0.006
64.25	0.094	3.576	0.29	0.012
64.2666	0.094	3.797	0.29	0.012
64.2833	0.094	3.986	0.284	0.012
64.3	0.094	4.143	0.29	0.012
64.3166	0.094	4.301	0.284	0.012
64.3333	0.094	4.443	0.284	0.012
64.35	0.094	4.553	0.284	0.006
64.3666	0.094	4.679	0.284	0.012
64.3833	0.094	4.774	0.284	0.006
64.4	0.094	4.852	0.284	0.006
64.4166	0.094	4.931	0.284	0.012
64.4333	0.094	5.01	0.284	0.012
64.45	0.094	5.057	0.284	0.006
64.4666	0.094	5.12	0.284	0.012
64.4833	0.094	5.199	0.284	0.006
64.5666	0.094	5.42	0.278	0.006
64.65	0.094	5.546	0.278	0
64.7333	0.094	5.656	0.271	0.006
64.8166	0.094	5.735	0.265	0
64.9	0.094	5.814	0.265	0.006
64.9833	0.063	5.861	0.265	0
65.0666	0.063	5.908	0.265	0
65.15	0.094	5.94	0.265	0
65.2333	0.094	5.955	0.265	0
65.3166	0.094	6.003	0.265	0
65.4	0.063	6.018	0.265	0
65.4833	0.094	6.034	0.265	0
65.5666	0.063	6.066	0.271	0
65.65	0.063	6.097	0.271	0
65.7333	0.063	6.113	0.278	0
65.8166	0.063	6.144	0.278	0
65.9	0.063	6.16	0.284	-0.006
65.9833	0.094	6.176	0.284	-0.006
66.0666	0.063	6.207	0.29	-0.012
66.15	0.063	6.223	0.297	-0.018
66.65	0.063	6.333	0.303	-0.037
67.15	0.063	6.412	0.341	-0.018
67.65	0.063	6.475	0.366	-0.006
68.15	0.063	6.538	0.392	-0.006
68.65	0.063	6.586	0.423	-0.006
69.15	0.063	6.633	0.449	0
69.65	0.094	6.664	0.468	-0.006
70.15	0.094	6.696	0.487	-0.012
70.65	0.063	6.727	0.499	-0.012
71.15	0.094	6.743	0.524	-0.012
71.65	0.094	6.79	0.55	-0.012
72.15	0.094	6.822	0.569	-0.006
72.65	0.094	6.838	0.581	-0.012

73.15	0.094	6.869	0.6	-0.025
73.65	0.094	6.885	0.607	-0.031
74.15	0.094	6.916	0.632	-0.018
76.15	0.094	6.979	0.683	-0.006
78.15	0.094	7.043	0.733	-0.018
80.15	0.094	7.074	0.765	-0.006
82.15	0.063	7.137	0.796	-0.018
84.15	0.063	7.184	0.828	-0.012
86.15	0.063	7.216	0.86	0
88.15	0.094	7.232	0.885	0.012
90.15	0.063	7.279	0.904	-0.018
92.15	0.063	7.295	0.929	-0.012
94.15	0.094	7.326	0.948	0
96.15	0.063	7.342	0.974	0.006
98.15	0.094	7.358	0.98	0.018
100.15	0.063	7.373	0.993	-0.006
102.15	0.063	7.389	0.999	-0.018
104.15	0.063	7.421	1.011	-0.025
106.15	0.063	7.421	1.037	0.006
108.15	0.063	7.452	1.049	0
110.15	0.063	7.468	1.056	0
112.15	0.063	7.484	1.075	-0.006
114.15	0.063	7.484	1.081	0
116.15	0.063	7.515	1.087	-0.012
118.15	0.063	7.531	1.106	0
120.15	0.063	7.547	1.113	0.006
122.15	0.063	7.562	1.125	0.018
124.15	0.063	7.562	1.125	0
126.15	0.063	7.578	1.125	0
128.15	0.063	7.562	1.138	-0.012
130.15	0.063	7.594	1.157	0.006
132.15	0.063	7.61	1.163	0.006
134.15	0.063	7.61	1.163	0
136.15	0.063	7.625	1.176	0
138.15	0.063	7.625	1.176	0
140.15	0.063	7.641	1.195	0.018
142.15	0.063	7.641	1.189	0
144.15	0.063	7.657	1.189	-0.018
146.15	0.063	7.657	1.214	0.018
148.15	0.063	7.673	1.214	0.012
150.15	0.063	7.673	1.22	-0.018
152.15	0.063	7.673	1.227	0.018
154.15	0.063	7.673	1.201	-0.006
156.15	0.031	7.689	1.176	-0.12
158.15	0.063	7.689	1.208	-0.069
160.15	0.063	7.689	1.239	-0.006
162.15	0.094	7.704	1.258	0.05
164.15	0.063	7.72	1.258	0.044
169.15	0.063	7.736	1.258	0.012
174.15	0.063	7.736	1.277	0.025
179.15	0.063	7.736	1.258	-0.018

184.15	0.063	7.752	1.271	-0.031
189.15	0.063	7.752	1.277	-0.037
194.15	0.031	7.767	1.283	-0.018
199.15	0.031	7.767	1.296	0.006
204.15	0.031	7.799	1.302	0
209.15	0.063	7.815	1.315	0.018
214.15	0.063	7.83	1.347	0.082
219.15	0.031	7.83	1.315	-0.012
224.15	0.063	7.846	1.34	0.031

STEP 2 16:00:40 (227.35 ELAPSED)

T ELAPSED	INPUT 1	2	3	4
227.3583	0.094	7.389	1.359	0.069
227.3666	0.126	7.058	1.359	0.069
227.375	0.126	6.822	1.359	0.069
227.3833	0.126	6.586	1.359	0.069
227.3916	0.126	6.365	1.366	0.069
227.4	0.126	6.16	1.366	0.069
227.4083	0.157	5.971	1.366	0.069
227.4166	0.157	5.798	1.366	0.069
227.425	0.157	5.624	1.366	0.069
227.4333	0.126	5.467	1.366	0.069
227.45	0.126	5.168	1.366	0.069
227.4666	0.094	4.915	1.366	0.069
227.4833	0.094	4.679	1.366	0.069
227.5	0.126	4.474	1.366	0.069
227.5166	0.126	4.285	1.366	0.069
227.5333	0.126	4.128	1.366	0.069
227.55	0.126	3.97	1.372	0.069
227.5666	0.126	3.828	1.372	0.069
227.5833	0.126	3.718	1.372	0.069
227.6	0.126	3.608	1.372	0.069
227.6166	0.126	3.497	1.372	0.069
227.6333	0.126	3.419	1.372	0.069
227.65	0.126	3.324	1.372	0.069
227.6666	0.126	3.245	1.372	0.069
227.6833	0.126	3.182	1.372	0.075
227.7666	0.126	2.899	1.378	0.069
227.85	0.126	2.71	1.378	0.075
227.9333	0.126	2.568	1.385	0.075
228.0166	0.126	2.457	1.385	0.075
228.1	0.126	2.379	1.391	0.075
228.1833	0.126	2.3	1.385	0.075
228.2666	0.126	2.237	1.385	0.075
228.35	0.126	2.19	1.385	0.075
228.4333	0.126	2.142	1.378	0.069
228.5166	0.126	2.095	1.378	0.069
228.6	0.126	2.064	1.378	0.069
228.6833	0.126	2.016	1.372	0.063

228.7666	0.126	1.985	1.372	0.063
228.85	0.126	1.953	1.366	0.063
228.9333	0.126	1.922	1.366	0.069
229.0166	0.126	1.89	1.353	0.056
229.1	0.126	1.874	1.359	0.05
229.1833	0.126	1.843	1.347	0.044
229.2666	0.126	1.827	1.34	0.044
229.35	0.126	1.796	1.334	0.037
229.85	0.126	1.67	1.302	0.037
230.35	0.126	1.591	1.264	0.031
230.85	0.157	1.496	1.227	0.018
231.35	0.126	1.433	1.195	0.018
231.85	0.157	1.386	1.163	0.037
232.35	0.126	1.323	1.132	0.031
232.85	0.126	1.276	1.094	0.018
233.35	0.126	1.228	1.068	0.012
233.85	0.126	1.181	1.03	0
234.35	0.126	1.15	1.005	0
234.85	0.126	1.118	0.986	-0.006
235.35	0.126	1.087	0.961	-0.006
235.85	0.157	1.055	0.942	0
236.35	0.126	1.039	0.923	0
236.85	0.157	1.008	0.91	0.012
237.35	0.157	0.992	0.891	0.012
239.35	0.157	0.898	0.847	0.075
241.35	0.157	0.819	0.765	0.012
243.35	0.126	0.756	0.714	0.006
245.35	0.126	0.709	0.67	0.012
247.35	0.126	0.661	0.626	0.006
249.35	0.126	0.614	0.619	0.05
251.35	0.157	0.582	0.613	0.107
253.35	0.126	0.551	0.588	0.107
255.35	0.126	0.519	0.556	0.082
257.35	0.126	0.488	0.505	0.037
259.35	0.126	0.456	0.487	0.025
261.35	0.126	0.425	0.461	0.012
263.35	0.094	0.409	0.43	-0.018
265.35	0.126	0.378	0.43	0.006
267.35	0.126	0.362	0.411	0.012
269.35	0.094	0.346	0.392	0.006
271.35	0.094	0.315	0.373	-0.031
273.35	0.094	0.299	0.36	-0.031
275.35	0.094	0.283	0.347	-0.025
277.35	0.094	0.267	0.328	-0.018
279.35	0.126	0.252	0.328	-0.012
281.35	0.094	0.236	0.322	0.006
283.35	0.094	0.22	0.316	0.012
285.35	0.094	0.204	0.303	0.018
287.35	0.094	0.189	0.297	0.012
289.35	0.094	0.189	0.284	0.006
291.35	0.094	0.173	0.271	0

293.35	0.094	0.157	0.259	-0.006
295.35	0.094	0.141	0.252	-0.006

FN: TNT7B.PRN
WELL TNT-07-MWB STEP-TEST DATA
2
1.48,2.23
0,169.7,227.57

STEP 1 7/7/90 10:34:46

		7B-PROD	7B-OBS		
T ELAPSED	INPUT 1	2	3	4	5
0.0083	-0.11	0.189	0	-0.012	0
0.0166	-0.11	0.473	0	-0.012	0.006
0.025	-0.055	0.725	0	-0.006	0.006
0.0333	-0.11	1.262	0	-0.012	0.006
0.0416	-0.11	1.388	0	-0.012	0.006
0.05	-0.11	1.294	0	-0.006	0.006
0.0583	-0.11	1.388	0	-0.012	0.006
0.0666	-0.11	1.515	0	-0.012	0.006
0.075	-0.11	1.893	0	-0.006	0.006
0.0833	-0.11	2.209	0	-0.012	0.006
0.1	-0.055	2.083	0	-0.006	0.006
0.1166	-0.11	2.651	0	-0.006	0.006
0.1333	-0.11	2.809	0	-0.012	0.006
0.15	-0.11	2.651	0	-0.012	0.006
0.1666	-0.11	2.966	0	-0.012	0.006
0.1833	-0.055	3.535	0	-0.006	0.006
0.2	-0.11	3.692	0	-0.012	0.006
0.2166	-0.11	3.44	0	-0.012	0.006
0.2333	-0.11	3.85	0	-0.006	0
0.25	-0.11	4.355	0	-0.012	0.012
0.2666	-0.11	4.324	0	-0.012	0.006
0.2833	-0.11	3.945	0	-0.018	0.006
0.3	-0.11	4.923	0	-0.012	0.006
0.3166	-0.11	4.955	0	-0.018	0
0.3333	-0.11	4.829	0	-0.006	0.006
0.4166	-0.11	5.27	0	-0.006	0.006
0.5	-0.11	5.965	-0.015	-0.006	0.006
0.5833	-0.11	5.965	-0.015	-0.018	0.006
0.6666	-0.11	5.965	-0.015	-0.018	0.006
0.75	-0.11	6.975	-0.015	-0.012	0.006
0.8333	-0.11	6.47	-0.015	-0.018	0.006
0.9166	-0.11	6.501	-0.015	-0.012	0
1	-0.11	6.88	-0.015	-0.018	0.006
1.0833	-0.11	7.259	-0.015	-0.018	0.006
1.1666	-0.11	7.354	-0.015	-0.018	0.006
1.25	-0.11	6.754	-0.015	-0.012	0.006
1.3333	-0.11	7.227	-0.015	-0.025	0
1.4166	-0.11	7.291	-0.015	-0.006	0.006
1.5	-0.11	7.448	-0.015	-0.025	0.006
1.5833	-0.11	7.227	-0.015	-0.012	0.006
1.6666	-0.11	7.701	-0.015	-0.025	0.006
1.75	-0.11	7.291	-0.015	-0.012	0.006
1.8333	-0.055	7.48	-0.015	-0.018	0.006
1.9166	-0.11	7.575	-0.015	-0.018	0.012
2	-0.11	7.48	-0.015	-0.012	0.006
2.5	-0.11	7.385	-0.015	-0.012	0.006
3	-0.11	7.385	-0.015	-0.018	0.006
3.5	-0.165	7.606	-0.015	-0.025	-0.006
4	-0.11	7.89	0	-0.018	-0.012

4.5	-0.11	7.48	0	-0.018	-0.006
5	-0.165	7.101	0	-0.018	0
5.5	-0.11	7.227	0	-0.018	0
6	-0.11	7.89	0.015	-0.018	0
6.5	-0.11	7.385	0.015	-0.012	-0.006
7	-0.11	7.385	0.015	-0.012	-0.006
7.5	-0.165	7.48	0.015	-0.006	-0.006
8	-0.11	7.701	0.031	-0.006	0
8.5	-0.11	7.038	0.031	0	0
9	-0.11	7.511	0.031	0	0.012
9.5	-0.11	7.511	0.031	0	0.012
10	-0.11	7.48	0.047	0	0
12	-0.11	7.354	0.063	-0.031	0.006
14	-0.11	7.448	0.063	-0.025	-0.006
16	-0.11	7.196	0.078	-0.012	-0.006
18	-0.055	6.628	0.094	-0.006	0
20	-0.11	7.164	0.094	-0.018	0
22	-0.11	7.322	0.11	-0.006	0.018
24	-0.11	6.754	0.126	0.012	0.006
26	-0.11	7.259	0.126	-0.012	0
28	-0.165	7.227	0.126	-0.018	0
30	-0.11	7.354	0.141	-0.012	0.012
32	-0.11	7.448	0.157	0	0.018
34	-0.11	7.322	0.157	0	0.018
36	-0.11	7.006	0.173	0.006	0.006
38	-0.11	6.786	0.173	0	0
40	-0.11	6.912	0.173	-0.012	0.018
42	-0.11	6.943	0.189	0	0.018
44	-0.11	7.511	0.189	0.012	0.018
46	-0.11	7.385	0.189	0.012	0.018
48	-0.11	7.827	0.204	0.025	0.025
50	-0.11	7.575	0.204	-0.006	0.012
52	-0.11	7.259	0.204	0.012	0.018
54	-0.165	7.417	0.204	0	0.006
56	-0.11	7.291	0.204	0.006	0.006
58	-0.11	7.006	0.204	0.018	0.012
60	-0.165	7.227	0.22	0.012	0.025
62	-0.11	7.196	0.22	0.037	0.025
64	-0.11	7.732	0.22	0.037	0.031
66	-0.11	7.196	0.236	0.037	0.031
68	-0.11	7.606	0.236	0.031	0.031
70	-0.11	7.417	0.236	0.031	0.031
72	-0.165	7.354	0.252	0.025	0.037
74	-0.11	7.227	0.252	0.037	0.037
76	-0.11	7.385	0.252	0.05	0.031
78	-0.165	7.354	0.252	0.012	0.025
80	-0.11	7.385	0.252	0.018	0.018
82	-0.11	7.354	0.252	0.044	0.025
84	-0.11	7.448	0.252	0.031	0.037
86	-0.165	6.912	0.267	0.037	0.031
88	-0.11	7.701	0.267	0.025	0.025
90	-0.11	7.48	0.252	0.037	0.044
92	-0.165	6.975	0.267	0.05	0.031
94	-0.11	7.638	0.267	0.006	0.031
96	-0.165	6.975	0.267	0.012	0.031
98	-0.165	7.417	0.267	0.044	0.031
100	-0.165	7.543	0.267	0.056	0.037
105	-0.165	7.732	0.283	0.044	0.031
110	-0.11	7.291	0.283	0.056	0.031

115	-0.11	7.385	0.283	0.056	0.031
120	-0.165	7.322	0.283	0.063	0.031
125	-0.165	7.006	0.283	0.05	0.031
130	-0.165	7.196	0.283	0.069	0.031
135	-0.165	7.511	0.283	0.069	0.031
140	-0.165	7.322	0.283	0.063	0.044
145	-0.165	7.322	0.299	0.069	0.05
150	-0.165	6.849	0.299	0.075	0.037
155	-0.165	7.196	0.299	0.063	0.031
160	-0.165	7.322	0.299	0.075	0.05
165	-0.165	7.07	0.299	0.063	0.044

STEP 2 13:24:04 (169.7 ELAPSED)

T ELAPSED	INPUT 1	2	3	4	5
169.7083	-0.165	7.101	0.299	0.075	0.037
169.7166	-0.165	7.859	0.299	0.082	0.037
169.725	-0.165	7.385	0.299	0.082	0.031
169.7333	-0.165	8.174	0.299	0.075	0.037
169.7416	-0.165	7.732	0.299	0.082	0.031
169.75	-0.165	8.395	0.315	0.075	0.037
169.7583	-0.165	8.174	0.299	0.075	0.037
169.7666	-0.165	8.49	0.299	0.075	0.031
169.775	-0.165	8.521	0.315	0.075	0.031
169.7833	-0.165	8.111	0.315	0.082	0.031
169.8	-0.221	8.269	0.315	0.082	0.031
169.8166	-0.165	8.585	0.315	0.075	0.031
169.8333	-0.165	8.963	0.299	0.082	0.031
169.85	-0.165	8.963	0.299	0.082	0.031
169.8666	-0.165	9.153	0.315	0.082	0.037
169.8833	-0.165	9.216	0.299	0.082	0.031
169.9	-0.165	9.5	0.299	0.082	0.031
169.9166	-0.165	9.816	0.315	0.082	0.031
169.9333	-0.165	9.658	0.299	0.075	0.031
169.95	-0.221	9.184	0.315	0.075	0.031
169.9666	-0.165	9.247	0.315	0.082	0.037
169.9833	-0.165	9.311	0.299	0.075	0.031
170	-0.221	9.626	0.315	0.082	0.031
170.0166	-0.165	9.784	0.299	0.082	0.031
170.0333	-0.165	10.163	0.315	0.075	0.031
170.1166	-0.165	10.415	0.315	0.075	0.031
170.2	-0.221	10.889	0.315	0.088	0.031
170.2833	-0.221	10.352	0.315	0.082	0.031
170.3666	-0.165	10.952	0.315	0.088	0.031
170.45	-0.165	11.078	0.315	0.088	0.037
170.5333	-0.165	11.551	0.315	0.088	0.031
170.6166	-0.165	11.141	0.315	0.075	0.031
170.7	-0.221	11.551	0.315	0.082	0.031
170.7833	-0.165	11.015	0.315	0.082	0.031
170.8666	-0.165	11.583	0.315	0.082	0.037
170.95	-0.221	11.836	0.315	0.082	0.031
171.0333	-0.165	11.267	0.315	0.088	0.037
171.1166	-0.221	11.772	0.315	0.082	0.037
171.2	-0.165	11.993	0.315	0.082	0.037
171.2833	-0.221	11.331	0.315	0.075	0.037
171.3666	-0.221	11.678	0.315	0.075	0.031
171.45	-0.221	11.867	0.315	0.082	0.031
171.5333	-0.221	11.836	0.315	0.069	0.031

171.6166	-0.165	12.12	0.315	0.069	0.031
171.7	-0.165	11.488	0.315	0.075	0.037
172.2	-0.165	11.867	0.315	0.063	0.037
172.7	-0.221	11.836	0.315	0.063	0.037
173.2	-0.221	11.615	0.33	0.075	0.044
173.7	-0.221	11.741	0.33	0.075	0.05
174.2	-0.221	11.836	0.33	0.063	0.044
174.7	-0.221	11.836	0.33	0.056	0.037
175.2	-0.221	11.867	0.33	0.063	0.031
175.7	-0.221	11.425	0.346	0.082	0.037
176.2	-0.165	11.615	0.346	0.069	0.037
176.7	-0.221	11.772	0.346	0.063	0.037
177.2	-0.165	11.457	0.346	0.056	0.037
177.7	-0.221	11.867	0.346	0.05	0.037
178.2	-0.165	11.394	0.362	0.069	0.044
178.7	-0.221	11.836	0.362	0.056	0.044
179.2	-0.165	11.867	0.362	0.031	0.037
179.7	-0.165	11.993	0.362	0.037	0.025
181.7	-0.165	11.804	0.393	0.063	0.031
183.7	-0.165	11.899	0.393	0.082	0.037
185.7	-0.165	11.299	0.393	0.082	0.037
187.7	-0.165	11.772	0.393	0.094	0.031
189.7	-0.165	11.899	0.409	0.101	0.037
191.7	-0.221	11.899	0.409	0.094	0.037
193.7	-0.165	11.457	0.425	0.05	0.05
195.7	-0.165	11.772	0.441	0.056	0.031
197.7	-0.165	11.867	0.425	0.069	0.044
199.7	-0.165	11.836	0.441	0.069	0.044
201.7	-0.165	11.741	0.441	0.094	0.037
203.7	-0.165	11.804	0.441	0.094	0.044
205.7	-0.165	11.836	0.441	0.101	0.037
207.7	-0.165	11.962	0.441	0.069	0.044
209.7	-0.165	11.678	0.456	0.107	0.044
211.7	-0.165	11.583	0.456	0.094	0.044
213.7	-0.165	12.025	0.456	0.101	0.044
215.7	-0.165	11.899	0.472	0.113	0.044
217.7	-0.165	12.277	0.456	0.082	0.037
219.7	-0.221	12.12	0.472	0.082	0.018
221.7	-0.165	11.646	0.472	0.082	0.044
223.7	-0.165	11.993	0.472	0.113	0.05
225.7	-0.165	12.341	0.472	0.101	0.05
227.5	-0.165	11.615	0.472	0.126	0.044

STEP 3 (RECOVERY) 14:22:34 (227.57 ELAPSED)

Elapsed Time	INPU	INPUT 2	INPUT 3	INPUT 4	INPUT 5
227.5783	-0.165	11.551	0.472	0.107	0.044
227.5866	-0.165	11.394	0.472	0.101	0.05
227.595	-0.165	11.173	0.472	0.094	0.05
227.6033	-0.165	10.983	0.472	0.101	0.044
227.6116	-0.165	10.762	0.472	0.101	0.05
227.62	-0.165	10.478	0.456	0.101	0.05
227.6283	-0.165	10.257	0.472	0.094	0.05
227.6366	-0.165	10.068	0.472	0.101	0.044
227.645	-0.165	9.879	0.456	0.094	0.05
227.6533	-0.165	9.658	0.472	0.107	0.05
227.67	-0.221	9.279	0.456	0.107	0.044
227.6866	-0.221	8.932	0.472	0.101	0.044

227.7033	-0.165	8.49	0.472	0.107	0.044
227.72	-0.165	8.143	0.488	0.101	0.037
227.7366	-0.221	7.827	0.472	0.094	0.044
227.7533	-0.221	7.48	0.472	0.094	0.044
227.77	-0.221	7.164	0.472	0.094	0.044
227.7866	-0.221	6.88	0.488	0.094	0.037
227.8033	-0.221	6.596	0.488	0.094	0.037
227.82	-0.221	6.344	0.472	0.094	0.037
227.8366	-0.221	6.091	0.472	0.094	0.037
227.8533	-0.221	5.839	0.488	0.094	0.037
227.87	-0.221	5.618	0.488	0.094	0.037
227.8866	-0.221	5.397	0.488	0.088	0.037
227.9033	-0.221	5.176	0.488	0.088	0.037
227.9866	-0.221	4.197	0.488	0.082	0.037
228.07	-0.221	3.44	0.488	0.082	0.037
228.1533	-0.221	2.84	0.488	0.075	0.037
228.2366	-0.221	2.367	0.488	0.082	0.037
228.32	-0.221	2.02	0.488	0.075	0.037
228.4033	-0.221	1.704	0.488	0.075	0.037
228.4866	-0.221	1.515	0.488	0.075	0.037
228.57	-0.221	1.325	0.488	0.082	0.044
228.6533	-0.221	1.167	0.488	0.082	0.044
228.7366	-0.221	1.073	0.488	0.082	0.05
228.82	-0.221	0.978	0.488	0.075	0.05
228.9033	-0.221	0.883	0.488	0.075	0.05
228.9866	-0.221	0.82	0.488	0.075	0.05
229.07	-0.221	0.82	0.488	0.082	0.05
229.1533	-0.221	0.757	0.472	0.082	0.05
229.2366	-0.221	0.725	0.472	0.082	0.05
229.32	-0.221	0.694	0.472	0.082	0.044
229.4033	-0.221	0.662	0.472	0.075	0.044
229.4866	-0.221	0.662	0.472	0.069	0.044
229.57	-0.221	0.631	0.472	0.069	0.037
230.07	-0.221	0.505	0.456	0.075	0.037
230.57	-0.221	0.41	0.441	0.088	0.044
231.07	-0.221	0.315	0.425	0.082	0.044
231.57	-0.221	0.252	0.409	0.101	0.037
232.07	-0.221	0.22	0.393	0.113	0.037
232.57	-0.221	0.189	0.393	0.113	0.044
233.07	-0.221	0.157	0.393	0.107	0.044
233.57	-0.221	0.126	0.378	0.088	0.044
234.07	-0.221	0.063	0.378	0.082	0.044
234.57	-0.221	0.063	0.362	0.101	0.044
235.07	-0.221	0.063	0.346	0.113	0.044
235.57	-0.221	0.063	0.346	0.113	0.044
236.07	-0.221	0.031	0.33	0.113	0.044
236.57	-0.221	0.031	0.315	0.088	0.044
237.07	-0.221	0	0.315	0.075	0.05
237.57	-0.221	0	0.315	0.075	0.044
239.57	-0.165	-0.094	0.299	0.069	0.044
241.57	-0.165	-0.126	0.267	0.101	0.05
243.57	-0.165	-0.252	0.236	0.088	0.031
245.57	-0.221	-0.284	0.22	0.101	0.05
247.57	-0.221	-0.315	0.204	0.088	0.044
249.57	-0.221	-0.347	0.173	0.094	0.037
251.57	-0.221	-0.347	0.173	0.082	0.037
253.57	-0.221	-0.347	0.157	0.107	0.044
255.57	-0.165	-0.378	0.141	0.101	0.025
257.57	-0.221	-0.378	0.126	0.107	0.044

259.57	-0.221	-0.347	0.126	0.119	0.05
261.57	-0.221	-0.347	0.11	0.107	0.044
263.57	-0.221	-0.378	0.11	0.069	0.05
265.57	-0.221	-0.41	0.094	0.094	0.044
267.57	-0.221	-0.41	0.094	0.101	0.05
269.57	-0.221	-0.378	0.078	0.088	0.044
271.57	-0.221	-0.41	0.078	0.088	0.05
273.57	-0.221	-0.41	0.063	0.082	0.05
275.57	-0.221	-0.41	0.063	0.063	0.044
277.57	-0.221	-0.41	0.047	0.082	0.037
279.57	-0.221	-0.41	0.047	0.075	0.031
281.57	-0.221	-0.41	0.031	0.037	0.025
283.57	-0.221	-0.41	0.031	0.031	0.031
285.57	-0.221	-0.441	0.015	0.063	0.012
287.57	-0.221	-0.441	0.015	0.037	0.018
289.57	-0.221	-0.441	0	0.056	0.018
291.57	-0.221	-0.41	0	0.056	0.037
293.57	-0.221	-0.441	0	0.05	0.031
295.57	-0.276	-0.41	0	0.018	0.012

FN: TNT7C.PRN
STEP TEST: WELL TNT-07-MWC
STEPS: 2
Q (CFM): 1.31,2.67
START TIMES (MIN): 0,59.9,240.1

2

1.31,2.67

0,59.9,240.1

	FN:TNT7C.STP		TNT7B.STP	TNT7A.STP		
ELAPSED T (STEP)	ELAP. T (TOTAL)	TNT7C	TNT7B	TNT7A	TNT3A	TNT8A
0.001	0.001	4.591	21.596	4.719	8.781	8.347
0.0083	0.0083	5.365	21.583	4.719	8.778	8.336
0.0166	0.0166	4.812	21.555	4.725	8.781	8.344
0.025	0.025	5.974	21.459	4.705	8.781	8.328
0.0333	0.0333	7.633	21.501	4.698	8.781	8.328
0.0416	0.0416	4.203	21.459	4.691	8.781	8.328
0.05	0.05	6.471	21.459	4.691	8.778	8.336
0.0583	0.0583	6.139	21.514	4.719	8.778	8.339
0.0666	0.0666	6.361	21.459	4.698	8.781	8.322
0.075	0.075	6.637	21.405	4.691	8.781	8.336
0.0833	0.0833	6.693	21.487	4.712	8.778	8.341
0.1	0.1	7.356	21.446	4.712	8.778	8.322
0.1166	0.1166	7.522	21.405	4.691	8.778	8.333
0.1333	0.1333	7.799	21.473	4.712	8.778	8.33
0.15	0.15	8.241	21.405	4.691	8.778	8.336
0.1666	0.1666	8.684	21.459	4.712	8.778	8.336
0.1833	0.1833	8.85	21.405	4.691	8.778	8.325
0.2	0.2	9.237	21.459	4.712	8.781	8.33
0.2166	0.2166	9.569	21.432	4.712	8.781	8.325
0.2333	0.2333	9.348	21.459	4.712	8.781	8.336
0.25	0.25	9.901	21.377	4.691	8.778	8.328
0.2666	0.2666	10.288	21.364	4.691	8.778	8.33
0.2833	0.2833	10.897	21.364	4.691	8.778	8.33
0.3	0.3	11.173	21.364	4.691	8.778	8.33
0.3166	0.3166	10.786	21.418	4.712	8.778	8.336
0.3333	0.3333	10.897	21.405	4.712	8.778	8.325
0.4166	0.4166	11.892	21.405	4.691	8.778	8.328
0.5	0.5	12.113	21.459	4.698	8.781	8.333
0.5833	0.5833	12.335	21.418	4.691	8.778	8.336
0.6666	0.6666	11.892	21.418	4.698	8.781	8.325
0.75	0.75	11.948	21.446	4.698	8.781	8.333
0.8333	0.8333	11.948	21.405	4.691	8.781	8.33
0.9166	0.9166	11.782	21.432	4.698	8.781	8.341
1	1	12.169	21.405	4.698	8.781	8.333
1.0833	1.0833	11.726	21.432	4.691	8.781	8.339
1.1666	1.1666	12.169	21.391	4.698	8.781	8.336
1.25	1.25	12.003	21.391	4.691	8.778	8.336
1.3333	1.3333	11.892	21.418	4.698	8.781	8.344
1.4166	1.4166	11.671	21.418	4.698	8.781	8.339
1.5	1.5	12.279	21.391	4.698	8.781	8.336
1.5833	1.5833	12.003	21.432	4.698	8.781	8.341
1.6666	1.6666	12.169	21.432	4.698	8.781	8.339
1.75	1.75	12.113	21.391	4.698	8.781	8.336
1.8333	1.8333	12.058	21.418	4.698	8.784	8.333
1.9166	1.9166	12.501	21.418	4.698	8.781	8.336
2	2	12.113	21.418	4.698	8.784	8.336
2.5	2.5	12.335	21.501	4.698	8.786	8.341
3	3	11.892	21.528	4.698	8.778	8.341

3.5	3.5	12.556	21.542	4.698	8.77	8.333
4	4	12.556	21.514	4.698	8.767	8.333
4.5	4.5	12.999	21.514	4.698	8.77	8.336
5	5	12.777	21.514	4.698	8.767	8.339
5.5	5.5	12.556	21.528	4.698	8.773	8.339
6	6	13.22	21.501	4.698	8.778	8.333
6.5	6.5	12.722	21.542	4.698	8.778	8.333
7	7	12.722	21.542	4.698	8.778	8.336
7.5	7.5	13.441	21.514	4.698	8.775	8.339
8	8	13.275	21.501	4.705	8.775	8.336
8.5	8.5	12.888	21.528	4.698	8.781	8.333
9	9	12.888	21.528	4.705	8.778	8.333
9.5	9.5	12.943	21.542	4.705	8.775	8.33
10	10	12.943	21.555	4.705	8.778	8.339
12	12	12.999	21.542	4.691	8.775	8.339
14	14	13.164	21.542	4.691	8.784	8.341
16	16	12.943	21.542	4.705	8.786	8.35
18	18	13.386	21.528	4.698	8.784	8.336
20	20	12.943	21.555	4.705	8.775	8.347
22	22	13.386	21.555	4.698	8.773	8.341
24	24	13.109	21.569	4.698	8.792	8.341
26	26	13.496	21.555	4.698	8.773	8.33
28	28	12.888	21.569	4.698	8.786	8.344
30	30	13.496	21.569	4.691	8.781	8.344
32	32	13.441	21.569	4.705	8.789	8.344
34	34	13.607	21.569	4.691	8.784	8.341
36	36	13.33	21.569	4.698	8.792	8.336
38	38	13.275	21.569	4.698	8.781	8.344
40	40	13.33	21.569	4.698	8.781	8.341
42	42	13.718	21.569	4.698	8.792	8.347
44	44	13.33	21.583	4.712	8.797	8.358
46	46	13.441	21.569	4.698	8.784	8.339
48	48	13.441	21.569	4.698	8.784	8.352
50	50	13.275	21.569	4.691	8.786	8.344
52	52	13.22	21.583	4.698	8.786	8.347
54	54	13.441	21.569	4.698	8.789	8.347
56	56	13.441	21.583	4.698	8.778	8.341
58	58	13.33	21.569	4.698	8.792	8.347
0	60	13.884	21.596	4.712	8.794	8.352
0.0083	60.0083	13.662	21.569	4.712	8.794	8.352
0.0166	60.0166	14.16	21.569	4.712	8.794	8.352
0.025	60.025	13.884	21.555	4.712	8.792	8.352
0.0333	60.0333	13.552	21.542	4.712	8.792	8.352
0.0416	60.0416	14.271	21.542	4.712	8.792	8.352
0.05	60.05	14.215	21.528	4.712	8.792	8.352
0.0583	60.0583	14.658	21.514	4.712	8.792	8.352
0.0666	60.0666	14.381	21.501	4.712	8.792	8.352
0.075	60.075	14.824	21.487	4.712	8.792	8.35
0.0833	60.0833	14.824	21.459	4.712	8.792	8.35
0.1	60.1	15.156	21.446	4.712	8.792	8.35
0.1166	60.1166	15.543	21.446	4.712	8.792	8.35
0.1333	60.1333	15.543	21.432	4.712	8.792	8.35
0.15	60.15	16.096	21.418	4.712	8.792	8.347
0.1666	60.1666	16.262	21.405	4.705	8.792	8.347
0.1833	60.1833	15.875	21.418	4.712	8.789	8.347
0.2	60.2	16.041	21.405	4.712	8.792	8.347
0.2166	60.2166	16.207	21.391	4.712	8.792	8.347
0.2333	60.2333	16.649	21.405	4.719	8.789	8.347
0.25	60.25	16.705	21.377	4.712	8.789	8.344

0.2666	60.2666	17.092	21.391	4.712	8.789	8.347
0.2833	60.2833	17.645	21.377	4.712	8.792	8.344
0.3	60.3	17.811	21.377	4.712	8.789	8.347
0.3166	60.3166	17.534	21.364	4.712	8.792	8.344
0.3333	60.3333	17.59	21.364	4.712	8.789	8.344
0.4166	60.4166	18.862	21.391	4.705	8.792	8.344
0.5	60.5	19.249	21.418	4.712	8.792	8.347
0.5833	60.5833	20.079	21.418	4.705	8.792	8.347
0.6666	60.6666	20.743	21.405	4.712	8.792	8.344
0.75	60.75	21.406	21.405	4.712	8.792	8.344
0.8333	60.8333	21.904	21.391	4.712	8.792	8.347
0.9166	60.9166	22.291	21.405	4.712	8.792	8.347
1	61	22.679	21.377	4.705	8.792	8.347
1.0833	61.0833	23.121	21.391	4.712	8.794	8.35
1.1666	61.1666	23.453	21.391	4.712	8.794	8.35
1.25	61.25	23.619	21.364	4.712	8.794	8.35
1.3333	61.3333	24.283	21.377	4.712	8.794	8.352
1.4166	61.4166	24.283	21.364	4.712	8.797	8.352
1.5	61.5	24.559	21.364	4.712	8.797	8.35
1.5833	61.5833	25.278	21.377	4.712	8.797	8.35
1.6666	61.6666	25.666	21.364	4.712	8.797	8.35
1.75	61.75	25.776	21.364	4.712	8.794	8.35
1.8333	61.8333	25.998	21.364	4.712	8.794	8.35
1.9166	61.9166	26.274	21.364	4.712	8.794	8.35
2	62	26.44	21.364	4.712	8.794	8.347
2.5	62.5	27.712	21.432	4.712	8.792	8.35
3	63	28.376	21.446	4.712	8.789	8.355
3.5	63.5	28.597	21.418	4.712	8.794	8.352
4	64	29.095	21.446	4.712	8.794	8.35
4.5	64.5	29.704	21.459	4.719	8.797	8.352
5	65	29.759	21.473	4.719	8.803	8.35
5.5	65.5	30.367	21.336	4.719	8.797	8.352
6	66	30.423	21.309	4.725	8.803	8.352
6.5	66.5	30.201	21.418	4.725	8.8	8.352
7	67	30.478	21.487	4.719	8.794	8.358
7.5	67.5	30.755	21.473	4.719	8.792	8.355
8	68	30.755	21.323	4.719	8.792	8.352
8.5	68.5	30.976	21.418	4.719	8.794	8.352
9	69	31.031	21.432	4.719	8.792	8.352
9.5	69.5	31.308	21.487	4.719	8.797	8.352
10	70	31.142	21.432	4.719	8.792	8.355
12	72	32.027	21.514	4.705	8.797	8.361
14	74	32.027	21.501	4.712	8.803	8.355
16	76	32.027	21.487	4.712	8.803	8.355
18	78	32.303	21.487	4.712	8.797	8.347
20	80	32.691	21.542	4.712	8.789	8.344
22	82	32.359	21.542	4.705	8.797	8.363
24	84	32.801	21.528	4.712	8.794	8.35
26	86	32.746	21.528	4.712	8.805	8.35
28	88	33.133	21.542	4.712	8.8	8.366
30	90	33.078	21.542	4.712	8.8	8.358
32	92	33.133	21.596	4.712	8.805	8.352
34	94	33.188	21.528	4.712	8.8	8.355
36	96	33.41	21.596	4.712	8.8	8.358
38	98	33.078	21.569	4.705	8.794	8.358
40	100	33.576	21.542	4.712	8.8	8.358
42	102	33.299	21.596	4.712	8.797	8.361
44	104	33.686	21.555	4.705	8.794	8.352
46	106	33.465	21.555	4.712	8.797	8.35

48	108	33.465	21.596	4.712	8.797	8.355
50	110	33.686	21.555	4.705	8.797	8.352
52	112	33.963	21.555	4.705	8.805	8.352
54	114	33.52	21.569	4.705	8.808	8.355
56	116	33.631	21.542	4.712	8.8	8.361
58	118	33.963	21.596	4.712	8.8	8.363
60	120	33.576	21.596	4.705	8.8	8.361
62	122	34.129	21.596	4.705	8.805	8.347
64	124	34.074	21.583	4.705	8.814	8.361
66	126	33.963	21.596	4.712	8.805	8.361
68	128	34.129	21.596	4.705	8.797	8.361
70	130	34.184	21.555	4.712	8.808	8.355
72	132	34.461	21.542	4.712	8.814	8.358
74	134	34.239	21.542	4.712	8.805	8.355
76	136	34.018	21.542	4.712	8.797	8.352
78	138	34.571	21.555	4.712	8.8	8.363
80	140	34.129	21.555	4.712	8.811	8.352
82	142	34.405	21.542	4.712	8.805	8.352
84	144	34.35	21.542	4.712	8.803	8.363
86	146	34.405	21.528	4.712	8.794	8.355
88	148	34.405	21.542	4.712	8.811	8.358
90	150	34.627	21.583	4.705	8.8	8.355
92	152	34.405	21.583	4.705	8.8	8.358
94	154	34.627	21.528	4.705	8.797	8.355
96	156	34.405	21.583	4.705	8.8	8.355
98	158	34.627	21.569	4.705	8.811	8.363
100	160	34.903	21.583	4.712	8.814	8.358
105	165	34.627	21.542	4.712	8.803	8.363
110	170	34.35	21.569	4.719	8.803	8.374
115	175	34.571	21.569	4.719	8.805	8.358
120	180	34.571	21.596	4.719	8.805	8.361
125	185	34.571	21.528	4.719	8.811	8.366
130	190	34.627	21.528	4.719	8.803	8.358
135	195	34.903	21.528	4.719	8.811	8.363
140	200	34.959	21.528	4.712	8.814	8.361
145	205	34.903	21.528	4.712	8.805	8.361
150	210	34.903	21.542	4.719	8.819	8.377
155	215	35.069	21.528	4.719	8.808	8.369
160	220	35.069	21.528	4.719	8.805	8.363
165	225	34.848	21.555	4.719	8.816	8.361
170	230	34.959	21.583	4.739	8.816	8.385
175	235	35.014	21.542	4.732	8.814	8.369
180	240	34.848	21.583	4.732	8.816	8.366
0	240.1	34.129	21.569	4.732	8.814	8.361
0.0083	240.1083	33.908	21.542	4.732	8.811	8.361
0.0166	240.1166	33.963	21.555	4.732	8.811	8.358
0.025	240.125	33.742	21.501	4.725	8.811	8.361
0.0333	240.1333	33.465	21.514	4.725	8.811	8.358
0.0416	240.1416	33.188	21.542	4.732	8.811	8.358
0.05	240.15	32.912	21.528	4.725	8.811	8.358
0.0583	240.1583	32.801	21.487	4.725	8.808	8.358
0.0666	240.1666	32.469	21.487	4.732	8.811	8.355
0.075	240.175	32.082	21.473	4.732	8.811	8.358
0.0833	240.1833	32.027	21.487	4.739	8.811	8.358
0.1	240.2	31.584	21.473	4.732	8.811	8.358
0.1166	240.2166	31.031	21.446	4.725	8.808	8.358
0.1333	240.2333	30.533	21.459	4.739	8.811	8.358
0.15	240.25	29.98	21.432	4.732	8.811	8.358
0.1666	240.2666	29.482	21.405	4.725	8.808	8.358

0.1833	240.2833	29.261	21.418	4.725	8.808	8.358
0.2	240.3	28.653	21.405	4.725	8.808	8.358
0.2166	240.3166	28.321	21.391	4.725	8.808	8.358
0.2333	240.3333	28.155	21.391	4.725	8.808	8.358
0.25	240.35	27.38	21.377	4.725	8.808	8.358
0.2666	240.3666	26.938	21.377	4.725	8.808	8.358
0.2833	240.3833	26.551	21.364	4.725	8.808	8.358
0.3	240.4	26.108	21.364	4.725	8.808	8.358
0.3166	240.4166	25.721	21.35	4.725	8.805	8.358
0.3333	240.4333	25.334	21.35	4.725	8.805	8.358
0.4166	240.5166	23.398	21.391	4.725	8.805	8.358
0.5	240.6	21.462	21.391	4.725	8.805	8.358
0.5833	240.6833	19.636	21.391	4.725	8.805	8.358
0.6666	240.7666	17.977	21.391	4.725	8.805	8.358
0.75	240.85	16.428	21.391	4.725	8.805	8.361
0.8333	240.9333	14.99	21.377	4.725	8.805	8.361
0.9166	241.0166	13.662	21.377	4.725	8.805	8.363
1	241.1	12.501	21.364	4.725	8.805	8.363
1.0833	241.1833	11.394	21.364	4.725	8.805	8.363
1.1666	241.2666	10.343	21.364	4.725	8.805	8.366
1.25	241.35	9.403	21.364	4.725	8.805	8.363
1.3333	241.4333	8.573	21.364	4.725	8.805	8.363
1.4166	241.5166	7.744	21.364	4.725	8.805	8.366
1.5	241.6	7.025	21.35	4.725	8.805	8.366
1.5833	241.6833	6.416	21.35	4.719	8.805	8.363
1.6666	241.7666	5.808	21.35	4.719	8.805	8.363
1.75	241.85	5.254	21.336	4.719	8.805	8.363
1.8333	241.9333	4.812	21.35	4.719	8.805	8.363
1.9166	242.0166	4.369	21.336	4.719	8.805	8.363
2	242.1	3.982	21.336	4.719	8.805	8.363
2.5	242.6	2.323	21.418	4.719	8.805	8.369
3	243.1	1.438	21.446	4.719	8.808	8.374
3.5	243.6	0.94	21.459	4.719	8.811	8.371
4	244.1	0.663	21.459	4.712	8.811	8.369
4.5	244.6	0.497	21.473	4.712	8.811	8.369
5	245.1	0.387	21.473	4.712	8.811	8.369
5.5	245.6	0.331	21.473	4.712	8.811	8.369
6	246.1	0.331	21.459	4.705	8.814	8.361
6.5	246.6	0.331	21.446	4.698	8.811	8.361
7	247.1	0.276	21.446	4.698	8.814	8.361
7.5	247.6	0.276	21.446	4.698	8.814	8.363
8	248.1	0.221	21.446	4.698	8.816	8.363
8.5	248.6	0.221	21.432	4.698	8.814	8.366
9	249.1	0.165	21.432	4.698	8.814	8.366
9.5	249.6	0.165	21.432	4.698	8.814	8.366
10	250.1	0.11	21.446	4.712	8.816	8.369
12	252.1	0.11	21.473	4.705	8.811	8.366
14	254.1	0.11	21.487	4.705	8.811	8.371
16	256.1	0.055	21.487	-3.003	2.796	2.8
18	258.1	0	-6.017	-3.003	2.796	2.8
20	260.1	0	-6.017	-3.003	2.796	2.8
22	262.1	0	-6.017	-3.003	2.796	2.8
24	264.1	-0.055	-6.017	-3.003	2.796	2.8

fn: TNT10B.PRN
DATA FILES: TNT10B.STP (PROD), TNT10B.OB1 (INPUT 1)
1
2.67
0,122.23

STEP 0 05/08 18:09:39

	10B-OBS	10BPROD		
Elapsed Time	INPUT 1	INPUT 2	INPUT 3	INPUT 4
0.0083	0.063	-0.488	0.012	-0.006
0.0166	0.094	0.677	0.012	-0.006
0.025	0.126	1.26	0.012	0
0.0333	0.157	1.748	0.012	0
0.0416	0.157	2.237	0.012	-0.006
0.05	0.157	2.71	0.012	-0.006
0.0583	0.157	3.166	0.012	-0.006
0.0666	0.189	3.592	0.012	0
0.075	0.189	4.002	0.012	0
0.0833	0.189	4.38	0.012	0
0.1	0.157	4.821	0.012	-0.006
0.1166	0.157	5.656	0.012	-0.006
0.1333	0.157	6.207	0.012	-0.006
0.15	0.157	6.696	0.012	-0.006
0.1666	0.157	7.153	0.012	0
0.1833	0.157	7.61	0.012	-0.006
0.2	0.157	8.067	0.012	-0.006
0.2166	0.157	8.492	0.012	0.006
0.2333	0.157	8.949	0.012	0
0.25	0.157	9.374	0.012	0
0.2666	0.157	9.784	0.012	-0.006
0.2833	0.157	10.194	0.012	-0.006
0.3	0.189	10.588	0.012	0
0.3166	0.189	10.982	0.012	-0.006
0.3333	0.189	11.375	0.012	-0.006
0.4166	0.157	13.124	0.012	0
0.5	0.126	14.7	0.006	0
0.5833	0.126	16.165	0.012	0
0.6666	0.126	17.489	0.012	0
0.75	0.157	18.686	0	0
0.8333	0.126	19.742	0	0
0.9166	0.126	20.735	0	0
1	0.126	21.617	0	0.006
1.0833	0.126	22.405	0	0.006
1.1666	0.126	23.145	0	0.012
1.25	0.126	23.823	0	0.006
1.3333	0.126	24.469	0	0.012
1.4166	0.126	25.036	0.006	0
1.5	0.126	25.572	0.006	0
1.5833	0.157	26.06	0.006	0.006
1.6666	0.157	26.517	0.006	0.006
1.75	0.126	26.943	0	0.006
1.8333	0.157	27.321	0	0.006
1.9166	0.157	27.683	0	0
2	0.157	28.014	0	0.006
2.5	0.126	29.464	0.006	0.006
3	0.126	30.346	0.006	0
3.5	0.094	30.897	0.006	0
4	0.094	31.275	0.006	0.006
4.5	0.094	31.528	0.006	0.006

5	0.126	31.748	0.006	0.012
5.5	0.094	31.874	0.006	0.012
6	0.094	32	0.006	0.012
6.5	0.126	32.079	0.006	0.006
7	0.126	32.158	0	0.012
7.5	0.094	32.221	0	0.012
8	0.094	32.284	0	0.006
8.5	0.126	32.378	0.006	0.006
9	0.094	32.457	0	0.006
9.5	0.126	32.567	0.006	0.006
10	0.126	32.662	0.006	0.006
12	0.063	32.851	0	0.018
14	0.031	32.898	0	0.025
16	0	33.04	0	0.012
18	0.126	33.135	0.006	0.012
20	0.094	33.277	0	0.012
22	0.063	33.371	0	0.012
24	0.063	33.702	0	0.012
26	0.063	33.812	0.006	0
28	0.063	33.812	0	0.012
30	0.031	33.749	0.006	0
32	0.094	33.576	0	0.006
34	0.063	33.623	0	0
36	0.063	33.733	0.006	0
38	0.063	33.749	0.006	0.006
40	0.063	33.781	0.006	0.012
42	0.063	33.781	0.006	0.006
44	0.063	33.859	0	0.006
46	0.063	33.923	0.006	0
48	0.063	33.938	0	0.006
50	0.063	33.97	0.006	0.012
52	0.063	33.986	0.012	0.006
54	0.094	34.064	0.006	0.006
56	0.063	34.049	0.006	-0.006
58	0.063	34.033	0.012	0.006
60	0.063	34.064	0.006	0.006
62	0.094	34.096	0	0
64	0.063	34.112	0	0.012
66	0.063	34.175	0	0
68	0.063	34.19	0.012	0.012
70	0.094	34.159	0.012	0.006
72	0.063	34.143	0.012	0.012
74	0.063	34.127	0.006	0.006
76	0.063	34.159	0.012	0.006
78	0.063	34.206	0.012	0.006
80	0.063	34.159	0.012	0.012
82	0.063	34.112	0.012	0.012
84	0.063	34.19	0.012	0.006
86	0.094	34.364	0.012	0.006
88	0.063	34.411	0.012	0.012
90	0.063	34.411	0.012	0

92	0.094	34.474	0.018	0.012
94	0.063	34.411	0.018	0.006
96	0.063	34.49	0.012	0.006
98	0.063	34.474	0.018	0.006
100	0.063	34.49	0.018	0.012
105	0.157	34.647	0.018	0.006
110	0.094	35.01	0.025	0.006
115	0.063	34.695	0.012	0.006
120	0.063	34.695	0.012	0.006

Step 1 5/08 20:11:53

RECOVERY STARTED AT 122.23 MINUTES ELAPSED TIME

ELAPSED T	INPUT 1	INPUT 2	INPUT 3	INPUT 4
122.2383	0.157	34.379	0.018	0.012
122.2466	0.157	34.238	0.018	0.018
122.255	0.189	34.112	0.018	0.018
122.2633	0.22	33.97	0.025	0.018
122.2716	0.22	33.828	0.018	0.018
122.28	0.252	33.686	0.018	0.018
122.2883	0.252	33.56	0.018	0.018
122.2966	0.252	33.403	0.018	0.018
122.305	0.252	33.261	0.018	0.018
122.3133	0.252	33.119	0.018	0.018
122.33	0.252	32.851	0.018	0.018
122.3466	0.22	32.252	0.018	0.018
122.3633	0.22	31.386	0.018	0.018
122.38	0.22	30.535	0.018	0.012
122.3966	0.22	29.668	0.018	0.012
122.4133	0.22	28.833	0.018	0.018
122.43	0.22	28.03	0.025	0.012
122.4466	0.22	27.226	0.018	0.018
122.4633	0.22	26.47	0.018	0.012
122.48	0.22	25.714	0.018	0.012
122.4966	0.252	24.973	0.018	0.018
122.5133	0.252	24.28	0.018	0.018
122.53	0.22	23.586	0.025	0.018
122.5466	0.252	22.893	0.025	0.018
122.5633	0.252	22.231	0.018	0.018
122.6466	0.22	19.159	0.018	0.018
122.73	0.22	16.449	0.018	0.012
122.8133	0.22	14.07	0.018	0.012
122.8966	0.22	11.911	0.012	0.012
122.98	0.22	10.083	0.012	0.012
123.0633	0.22	8.539	0.012	0.012
123.1466	0.22	7.106	0.018	0.012
123.23	0.22	5.735	0.018	0.012
123.3133	0.22	4.742	0.018	0.012
123.3966	0.22	3.812	0.018	0.012
123.48	0.22	2.977	0.018	0.012

123.5633	0.22	2.3	0.018	0.012
123.6466	0.22	1.748	0.018	0.012
123.73	0.22	1.244	0.018	0.012
123.8133	0.22	0.85	0.018	0.012
123.8966	0.22	0.504	0.018	0.012
123.98	0.22	0.189	0.018	0.012
124.0633	0.22	-0.063	0.018	0.012
124.1466	0.22	-0.315	0.018	0.012
124.23	0.22	-0.519	0.018	0.012
124.73	0.189	-1.37	0.018	0.006
125.23	0.189	-1.843	0.018	0.006
125.73	0.189	-2.095	0.018	0.006
126.23	0.189	-2.237	0.018	0
126.73	0.189	-2.3	0.025	0
127.23	0.189	-2.3	0.018	0
127.73	0.189	-2.316	0.025	0
128.23	0.22	-2.316	0.025	0
128.73	0.189	-2.316	0.025	0.006

129.23	0.22	-2.3	0.025	0.006
129.73	0.22	-2.3	0.025	0.006
130.23	0.22	-2.253	0.025	0.006
130.73	0.22	-2.205	0.025	0.006
131.23	0.22	-2.205	0.025	0.006
131.73	0.22	-2.221	0.025	0.006
132.23	0.22	-2.174	0.025	0.006
134.23	0.157	-1.591	0.025	0.006
136.23	0.126	0.504	0.025	0.006
138.23	0.126	0.724	0.025	0.006
140.23	0.126	1.087	0.025	0.012
142.23	0.126	1.307	0.025	0.006
144.23	0.126	1.323	0.025	0.012
146.23	0.126	1.323	0.025	0.012
148.23	0.126	1.323	0.025	0.012
150.23	0.126	1.323	0.025	0.012
152.23	0.126	1.323	0.025	0.012
154.23	0.126	1.307	0.025	0.012
156.23	0.094	1.307	0.018	0.012
158.23	0.094	1.307	0.031	0.012

REFERENCES

Birsoy, Y.K, and W.K. Summers, 1980, Determination of aquifer parameters from step tests and intermittent pumping data, Ground Water, v.18, no.2, p.137-146.

Cooper, H.H., Jr., and C.E. Jacob, 1946, A generalized graphical method for evaluating formation constants and summarizing well field history, Trans. Amer. Geophys. Union, 27 p., p.526-534.

Kruseman, G.P., and N.A. DeRidder, 1983, Analysis and Evaluation of Pumping Test Data, Internat. Inst. for Land Reclamation and Improvement, Wageningen, The Netherlands.

Theis, C.V., 1935, The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage: Trans. Am. Geophys. Union, v. 16, p 519-524.

Appendix M

Chemical Data Tables

JMM James M. Montgomery
Consulting Engineers Inc.

INSTALLATION RESTORATION PROGRAM

CHEMICAL REPORT
Sun Sep 9 13:40:47 1990

For Parameters :

Installation = Sierra Ordnance Depot
Beginning Date = 01-jan-75
Ending Date = 09/07/90
Media Type = Chemical Ground Water (CGW)
Maximum (X, Y) = (746167, 4460707)
Minimum (X, Y) = (736000, 4441000)
Booleans = N

Sep 9, 1990   Installation: Sierra Ordnance Depot   Page 1

Analytical Results for Chemical Ground Water

From: 01-jan-75 To: 09/07/90

(Booleans LT and ND are excluded)

Site: WELL ALF-01-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
90.4	17-apr-1990	99	TDS		762000.000	UGL
90.4	31-may-1990	99	TDS		900000.000	UGL
90.4	31-may-1990	99	TDS		884000.000	UGL
90.4	17-apr-1990	SB01	HG		0.488	UGL
90.4	17-apr-1990	SD21	SE		16.300	UGL
90.4	31-may-1990	SD21	SE		18.600	UGL
90.4	31-may-1990	SD21	SE		18.300	UGL
90.4	31-may-1990	SD22	AS		3.410	UGL
90.4	17-apr-1990	TT10	CL		100000.000	UGL
90.4	31-may-1990	TT10	CL		100000.000	UGL
90.4	31-may-1990	TT10	CL		100000.000	UGL
90.4	17-apr-1990	TT10	SO4		300000.000	UGL
90.4	31-may-1990	TT10	SO4		320000.000	UGL
90.4	31-may-1990	TT10	SO4		310000.000	UGL

Site: WELL ALF-02-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
85.5	17-apr-1990	99	TDS		4060000.000	UGL
85.5	01-jun-1990	99	TDS		1100000.000	UGL
85.5	17-apr-1990	SD21	SE		6.070	UGL
85.5	01-jun-1990	SD21	SE		6.790	UGL
85.5	01-jun-1990	SD22	AS		6.720	UGL
85.5	01-jun-1990	TF18	CYN		3.310	UGL
85.5	17-apr-1990	TT10	CL		67000.000	UGL
85.5	01-jun-1990	TT10	CL		66000.000	UGL
85.5	17-apr-1990	TT10	SO4		450000.000	UGL
85.5	01-jun-1990	TT10	SO4		440000.000	UGL
85.5	17-apr-1990	UM20	TRCLE		41.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: WELL ALF-03-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
83.3	17-apr-1990	99	TDS		1250000.000	UGL
83.3	17-apr-1990	99	TDS		1300000.000	UGL
83.3	01-jun-1990	99	TDS		1250000.000	UGL
83.3	17-apr-1990	SD21	SE		14.900	UGL
83.3	17-apr-1990	SD21	SE		15.300	UGL
83.3	01-jun-1990	SD21	SE		16.600	UGL
83.3	01-jun-1990	SD22	AS		4.160	UGL
83.3	17-apr-1990	TT10	CL		270000.000	UGL
83.3	01-jun-1990	TT10	CL		270000.000	UGL
83.3	17-apr-1990	TT10	SO4		260000.000	UGL
83.3	01-jun-1990	TT10	SO4		260000.000	UGL
83.3	17-apr-1990	UM20	CHCL3		1.130	UGL
83.3	17-apr-1990	UM20	CHCL3		1.030	UGL

Site: WELL CCB-01-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
77.1	16-apr-1990	99	TDS		516000.000	UGL
77.1	01-jun-1990	99	TDS		564000.000	UGL
77.1	16-apr-1990	SD21	SE		3.410	UGL
77.1	01-jun-1990	SD21	SE		3.330	UGL
77.1	01-jun-1990	SD22	AS		8.640	UGL
77.1	16-apr-1990	TT10	CL		33000.000	UGL
77.1	01-jun-1990	TT10	CL		32200.000	UGL
77.1	16-apr-1990	TT10	SO4		116000.000	UGL
77.1	01-jun-1990	TT10	SO4		111000.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: WELL CCB-02-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
82.2	16-apr-1990	99	TDS		740000.000	UGL
85.2	02-jun-1990	99	TDS		808000.000	UGL
82.2	16-apr-1990	SB01	HG		0.488	UGL
82.2	16-apr-1990	SD21	SE		9.690	UGL
85.2	02-jun-1990	SD21	SE		10.600	UGL
85.2	02-jun-1990	SD22	AS		7.140	UGL
82.2	16-apr-1990	TT10	CL		100000.000	UGL
85.2	02-jun-1990	TT10	CL		97000.000	UGL
82.2	16-apr-1990	TT10	SO4		260000.000	UGL
85.2	02-jun-1990	TT10	SO4		238000.000	UGL

Site: WELL DMO-03-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
94.8	19-apr-1990	99	TDS		902000.000	UGL
94.8	31-may-1990	99	TDS		1070000.000	UGL
94.8	31-may-1990	99	TDS		1090000.000	UGL
94.8	19-apr-1990	SD21	SE		11.300	UGL
94.8	31-may-1990	SD21	SE		13.200	UGL
94.8	31-may-1990	SD21	SE		12.600	UGL
94.8	31-may-1990	SD22	AS		2.770	UGL
94.8	19-apr-1990	TT10	CL		66000.000	UGL
94.8	31-may-1990	TT10	CL		52000.000	UGL
94.8	31-may-1990	TT10	CL		53000.000	UGL
94.8	19-apr-1990	TT10	SO4		450000.000	UGL
94.8	31-may-1990	TT10	SO4		380000.000	UGL
94.8	31-may-1990	TT10	SO4		380000.000	UGL
94.8	19-apr-1990	UM20	TRCLE		10.500	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: WELL DNO-04-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
94.9	19-apr-1990	99	TDS		710000.000	UGL
94.9	31-may-1990	99	TDS		776000.000	UGL
94.9	19-apr-1990	SD21	SE		5.110	UGL
94.9	31-may-1990	SD21	SE		6.220	UGL
94.9	31-may-1990	SD22	AS		4.260	UGL
94.9	19-apr-1990	TT10	CL		60000.000	UGL
94.9	31-may-1990	TT10	CL		50000.000	UGL
94.9	19-apr-1990	TT10	SO4		224000.000	UGL
94.9	31-may-1990	TT10	SO4		223000.000	UGL
94.9	19-apr-1990	UM20	TRCLE		4.190	UGL

Site: WELL DNO-05-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
94.1	19-apr-1990	99	TDS		826000.000	UGL
94.1	19-apr-1990	99	TDS		840000.000	UGL
94.1	31-may-1990	99	TDS		916000.000	UGL
94.1	19-apr-1990	SD21	SE		11.600	UGL
94.1	19-apr-1990	SD21	SE		11.800	UGL
94.1	31-may-1990	SD21	SE		11.400	UGL
94.1	31-may-1990	SD22	AS		4.480	UGL
94.1	19-apr-1990	TT10	CL		60000.000	UGL
94.1	19-apr-1990	TT10	CL		60000.000	UGL
94.1	31-may-1990	TT10	CL		60000.000	UGL
94.1	19-apr-1990	TT10	SO4		330000.000	UGL
94.1	19-apr-1990	TT10	SO4		330000.000	UGL
94.1	31-may-1990	TT10	SO4		280000.000	UGL
94.1	19-apr-1990	UM20	TRCLE		20.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: WELL DSB-04-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
22.9	08-jun-1990	SD21	SE		7.700	UGL
22.9	08-jun-1990	SD23	AG		0.425	UGL

Site: WELL PSW-02

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
120.0	07-may-1990	99	TDS		850000.000	UGL
120.0	07-may-1990	99	TDS		680000.000	UGL
120.0	07-jun-1990	99	TDS		732000.000	UGL
120.0	07-jun-1990	99	TDS		754000.000	UGL
120.0	07-jun-1990	SD20	PB		3.470	UGL
120.0	07-jun-1990	SD20	PB		3.250	UGL
120.0	07-jun-1990	SD21	SE		4.370	UGL
120.0	07-may-1990	SD22	AS		5.970	UGL
120.0	07-may-1990	SD22	AS		5.970	UGL
120.0	07-jun-1990	TF18	CYN		11.300	UGL
120.0	07-may-1990	TT10	CL		60000.000	UGL
120.0	07-may-1990	TT10	CL		60000.000	UGL
120.0	07-jun-1990	TT10	CL		66000.000	UGL
120.0	07-jun-1990	TT10	CL		66000.000	UGL
120.0	07-may-1990	TT10	SO4		380000.000	UGL
120.0	07-may-1990	TT10	SO4		370000.000	UGL
120.0	07-jun-1990	TT10	SO4		293000.000	UGL
120.0	07-jun-1990	TT10	SO4		300000.000	UGL

Site: WELL PSW-08

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
120.0	07-may-1990	99	TDS		740000.000	UGL
120.0	07-jun-1990	99	TDS		666000.000	UGL
120.0	07-jun-1990	SD20	PB		3.900	UGL
120.0	07-may-1990	SD22	AS		7.460	UGL
120.0	07-may-1990	TT10	CL		44000.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: WELL PSW-08 (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
120.0	07-jun-1990	TT10	CL		44000.000	UGL
120.0	07-may-1990	TT10	SO4		310000.000	UGL
120.0	07-jun-1990	TT10	SO4		289000.000	UGL

Site: WELL PSW-09

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
120.0	07-may-1990	99	TDS		340000.000	UGL
120.0	07-jun-1990	99	TDS		310000.000	UGL
120.0	07-jun-1990	SD20	PB		1.950	UGL
120.0	07-may-1990	SD22	AS		3.200	UGL
120.0	07-jun-1990	TF18	CYN		11.200	UGL
120.0	07-may-1990	TT10	CL		17100.000	UGL
120.0	07-jun-1990	TT10	CL		16900.000	UGL
120.0	07-may-1990	TT10	SO4		57100.000	UGL
120.0	07-jun-1990	TT10	SO4		50000.000	UGL

Site: WELL TNT-01-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.4	20-apr-1990	99	TDS		864000.000	UGL
55.4	20-apr-1990	99	TDS		856000.000	UGL
55.4	08-jun-1990	99	TDS		830000.000	UGL
55.4	08-jun-1990	99	TDS		840000.000	UGL
55.4	08-jun-1990	SD20	PB		7.480	UGL
55.4	08-jun-1990	SD20	PB		10.200	UGL
55.4	20-apr-1990	SD22	AS		18.200	UGL
55.4	20-apr-1990	TT10	CL		47000.000	UGL
55.4	20-apr-1990	TT10	CL		53000.000	UGL
55.4	08-jun-1990	TT10	CL		40000.000	UGL
55.4	08-jun-1990	TT10	CL		41000.000	UGL
55.4	20-apr-1990	TT10	SO4		190000.000	UGL
55.4	20-apr-1990	TT10	SO4		200000.000	UGL
55.4	08-jun-1990	TT10	SO4		188000.000	UGL
55.4	08-jun-1990	TT10	SO4		185000.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: WELL TNT-01-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.4	08-jun-1990	UM20	TRCLE		29.500	UGL
55.4	08-jun-1990	UM20	TRCLE		30.500	UGL
55.4	20-apr-1990	UW14	135TNB		950.000	UGL
55.4	20-apr-1990	UW14	135TNB		1100.000	UGL
55.4	08-jun-1990	UW14	135TNB		640.000	UGL
55.4	08-jun-1990	UW14	135TNB		1100.000	UGL
55.4	20-apr-1990	UW14	246TNT		1.050	UGL
55.4	08-jun-1990	UW14	246TNT		1.220	UGL
55.4	20-apr-1990	UW14	24DNT		66.000	UGL
55.4	20-apr-1990	UW14	24DNT		90.000	UGL
55.4	08-jun-1990	UW14	24DNT		46.700	UGL
55.4	08-jun-1990	UW14	24DNT		86.000	UGL
55.4	20-apr-1990	UW14	HMX		3.700	UGL
55.4	20-apr-1990	UW14	HMX		1.950	UGL
55.4	20-apr-1990	UW14	RDX		90.000	UGL
55.4	20-apr-1990	UW14	RDX		99.000	UGL
55.4	08-jun-1990	UW14	RDX		54.000	UGL
55.4	08-jun-1990	UW14	RDX		87.000	UGL
55.4	20-apr-1990	UW14	TETRYL		9.920	UGL
55.4	20-apr-1990	UW14	TETRYL		9.680	UGL

Site: WELL TNT-01-MWB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.0	20-apr-1990	99	TDS		878000.000	UGL
56.0	05-jun-1990	99	TDS		946000.000	UGL
56.0	05-jun-1990	SD22	AS		5.440	UGL
56.0	20-apr-1990	TT10	CL		120000.000	UGL
56.0	20-apr-1990	TT10	SO4		260000.000	UGL

Site: WELL TNT-01-MWC

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.9	20-apr-1990	99	TDS		806000.000	UGL
55.9	05-jun-1990	99	TDS		766000.000	UGL
55.9	05-jun-1990	SD22	AS		6.180	UGL
55.9	20-apr-1990	TT10	CL		90000.000	UGL

Site: WELL TNT-01-MWC (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.9	20-apr-1990	TT10	SO4		250000.000	UGL
55.9	20-apr-1990	UW14	135TNB		0.793	UGL
55.9	05-jun-1990	UW14	RDX		4.180	UGL

Site: WELL TNT-02-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
54.3	21-apr-1990	99	TDS		1280000.000	UGL
54.3	04-jun-1990	99	TDS		1280000.000	UGL
54.3	21-apr-1990	SD21	SE		4.050	UGL
54.3	04-jun-1990	SD21	SE		3.910	UGL
54.3	04-jun-1990	SD22	AS		7.360	UGL
54.3	21-apr-1990	TT10	CL		160000.000	UGL
54.3	21-apr-1990	TT10	SO4		260000.000	UGL
54.3	21-apr-1990	UW14	135TNB		230.000	UGL
54.3	04-jun-1990	UW14	135TNB		220.000	UGL
54.3	21-apr-1990	UW14	246TNT		7.860	UGL
54.3	04-jun-1990	UW14	246TNT		8.140	UGL
54.3	21-apr-1990	UW14	24DNT		6.920	UGL
54.3	04-jun-1990	UW14	24DNT		5.930	UGL
54.3	21-apr-1990	UW14	HMX		3.760	UGL
54.3	21-apr-1990	UW14	RDX		250.000	UGL
54.3	04-jun-1990	UW14	RDX		220.000	UGL

Site: WELL TNT-02-MWB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
54.6	21-apr-1990	99	TDS		976000.000	UGL
54.6	04-jun-1990	99	TDS		900000.000	UGL
54.6	04-jun-1990	SD22	AS		14.000	UGL
54.6	21-apr-1990	TT10	CL		140000.000	UGL
54.6	21-apr-1990	TT10	SO4		250000.000	UGL
54.6	04-jun-1990	UW14	135TNB		1.380	UGL
54.6	04-jun-1990	UW14	TETRYL		0.754	UGL

Site: WELL TNT-02-MWC

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
53.9	21-apr-1990	99	TDS		738000.000	UGL
54.0	04-jun-1990	99	TDS		726000.000	UGL
53.9	04-jun-1990	SD22	AS		5.120	UGL
53.9	21-apr-1990	TT10	CL		77000.000	UGL
53.9	21-apr-1990	TT10	SO4		240000.000	UGL
53.9	04-jun-1990	UW14	TETRYL		0.813	UGL

Site: WELL TNT-03-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
52.7	01-may-1990	99	TDS		956000.000	UGL
52.7	08-jun-1990	99	TDS		808000.000	UGL
52.7	01-may-1990	TT10	CL		44000.000	UGL
52.7	08-jun-1990	TT10	CL		46000.000	UGL
52.7	01-may-1990	TT10	SO4		107000.000	UGL
52.7	08-jun-1990	TT10	SO4		102000.000	UGL
52.7	08-jun-1990	UW14	135TNB		13.000	UGL
52.7	08-jun-1990	UW14	24DNT		6.190	UGL
52.7	08-jun-1990	UW14	RDX		34.200	UGL

Site: WELL TNT-04-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
53.7	01-may-1990	99	TDS		996000.000	UGL
53.7	08-jun-1990	99	TDS		940000.000	UGL
53.7	01-may-1990	SD21	SE		4.370	UGL
53.7	08-jun-1990	SD21	SE		3.620	UGL
53.7	01-may-1990	TT10	CL		200000.000	UGL
53.7	08-jun-1990	TT10	CL		180000.000	UGL
53.7	01-may-1990	TT10	SO4		260000.000	UGL
53.7	08-jun-1990	TT10	SO4		243000.000	UGL
53.7	08-jun-1990	UW14	135TNB		3.380	UGL
53.7	08-jun-1990	UW14	246TNT		1.030	UGL
53.7	08-jun-1990	UW14	24DNT		10.300	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: WELL TNT-05-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
58.5	02-may-1990	99	TDS		786000.000	UGL
58.5	07-jun-1990	99	TDS		716000.000	UGL
58.5	02-may-1990	SD21	SE		4.150	UGL
58.5	07-jun-1990	SD21	SE		3.510	UGL
58.5	02-may-1990	TT10	CL		71000.000	UGL
58.5	07-jun-1990	TT10	CL		66000.000	UGL
58.5	02-may-1990	TT10	SO4		115000.000	UGL
58.5	07-jun-1990	TT10	SO4		138000.000	UGL
58.5	07-jun-1990	UW14	135TNB		6.470	UGL

Site: WELL TNT-06-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
54.6	02-may-1990	99	TDS		1570000.000	UGL
54.6	06-jun-1990	99	TDS		1530000.000	UGL
54.6	06-jun-1990	SB01	HG		0.251	UGL
54.6	06-jun-1990	SD20	PB		7.050	UGL
54.6	02-may-1990	SD21	SE		8.840	UGL
54.6	06-jun-1990	SD21	SE		6.820	UGL
54.6	02-may-1990	TT10	CL		240000.000	UGL
54.6	02-may-1990	TT10	SO4		440000.000	UGL
54.6	06-jun-1990	UW14	135TNB		2.340	UGL
54.6	06-jun-1990	UW14	24DNT		0.850	UGL

Site: WELL TNT-07-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.1	18-apr-1990	99	TDS		978000.000	UGL
56.1	06-jun-1990	99	TDS		802000.000	UGL
56.1	06-jun-1990	SD20	PB		6.620	UGL
56.1	18-apr-1990	TT10	CL		99000.000	UGL
56.1	18-apr-1990	TT10	SO4		181000.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: WELL TNT-07-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.1	18-apr-1990	UW14	135TNB		5.590	UGL
56.1	06-jun-1990	UW14	135TNB		4.980	UGL
56.1	18-apr-1990	UW14	24DNT		2.040	UGL
56.1	06-jun-1990	UW14	24DNT		2.560	UGL
56.1	18-apr-1990	UW14	TETRYL		2.790	UGL

Site: WELL TNT-07-MWB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.0	18-apr-1990	99	TDS		1160000.000	UGL
56.0	06-jun-1990	99	TDS		814000.000	UGL
56.0	06-jun-1990	SD20	PB		9.000	UGL
56.0	18-apr-1990	TT10	CL		150000.000	UGL
56.0	18-apr-1990	TT10	SO4		260000.000	UGL

Site: WELL TNT-07-MWC

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.0	18-apr-1990	99	TDS		812000.000	UGL
56.0	06-jun-1990	99	TDS		760000.000	UGL
56.0	06-jun-1990	SD20	PB		8.790	UGL
56.0	18-apr-1990	TT10	CL		99000.000	UGL
56.0	18-apr-1990	TT10	SO4		260000.000	UGL

Site: WELL TNT-08-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.3	03-may-1990	99	TDS		792000.000	UGL
55.3	07-jun-1990	99	TDS		778000.000	UGL
55.3	07-jun-1990	SD20	PB		2.170	UGL
55.3	03-may-1990	SD22	AS		13.300	UGL
55.3	03-may-1990	TT10	CL		48000.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: WELL TNT-08-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.3	07-jun-1990	TT10	CL		52000.000	UGL
55.3	03-may-1990	TT10	SO4		240000.000	UGL
55.3	07-jun-1990	TT10	SO4		239000.000	UGL
55.3	03-may-1990	UM20	TRCLE		7.430	UGL
55.3	07-jun-1990	UM20	TRCLE		9.330	UGL
55.3	07-jun-1990	UW14	135TNB		0.885	UGL

Site: WELL TNT-09-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.0	03-may-1990	99	TDS		752000.000	UGL
55.0	06-jun-1990	99	TDS		736000.000	UGL
55.0	06-jun-1990	SD20	PB		10.700	UGL
55.0	03-may-1990	SD22	AS		8.960	UGL
55.0	03-may-1990	TT10	CL		43000.000	UGL
55.0	03-may-1990	TT10	SO4		280000.000	UGL
55.0	06-jun-1990	UW14	135TNB		3.810	UGL

Site: WELL TNT-10-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.0	30-apr-1990	99	TDS		1050000.000	UGL
56.0	30-apr-1990	99	TDS		994000.000	UGL
56.0	03-jun-1990	99	TDS		1010000.000	UGL
56.0	03-jun-1990	99	TDS		932000.000	UGL
56.0	30-apr-1990	SB01	HG		0.255	UGL
56.0	30-apr-1990	SD22	AS		12.000	UGL
56.0	30-apr-1990	SD22	AS		11.500	UGL
56.0	03-jun-1990	SD22	AS		10.200	UGL
56.0	03-jun-1990	SD22	AS		10.600	UGL
56.0	30-apr-1990	TT10	CL		88000.000	UGL
56.0	30-apr-1990	TT10	CL		86000.000	UGL
56.0	30-apr-1990	TT10	SO4		190000.000	UGL

Site: WELL TNT-10-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.0	30-apr-1990	TT10	SO4		189000.000	UGL
56.0	30-apr-1990	UM20	12DCLE		101.000	UGL
56.0	30-apr-1990	UM20	CCL4		190.000	UGL
56.0	30-apr-1990	UM20	CHCL3		923.000	UGL
56.0	30-apr-1990	UM20	TRCLE		952.000	UGL

Site: WELL TNT-10-MWB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.8	30-apr-1990	99	TDS		802000.000	UGL
56.8	03-jun-1990	99	TDS		830000.000	UGL
56.8	30-apr-1990	SD22	AS		11.400	UGL
56.8	03-jun-1990	SD22	AS		12.800	UGL
56.8	30-apr-1990	TT10	CL		130000.000	UGL
56.8	30-apr-1990	TT10	SO4		233000.000	UGL

Site: WELL TNT-10-MWC

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.9	30-apr-1990	99	TDS		636000.000	UGL
55.9	03-jun-1990	99	TDS		640000.000	UGL
55.9	30-apr-1990	SD22	AS		12.400	UGL
55.9	03-jun-1990	SD22	AS		9.380	UGL
55.9	30-apr-1990	TT10	CL		71000.000	UGL
55.9	30-apr-1990	TT10	SO4		212000.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: WELL TNT-11-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
59.2	03-may-1990	99	TDS		2180000.000	UGL
59.2	07-jun-1990	99	TDS		2090000.000	UGL
59.2	03-may-1990	SD21	SE		9.160	UGL
59.2	07-jun-1990	SD21	SE		7.990	UGL
59.2	03-may-1990	SD22	AS		15.200	UGL
59.2	03-may-1990	TT10	CL		190000.000	UGL
59.2	07-jun-1990	TT10	CL		180000.000	UGL
59.2	03-may-1990	TT10	SO4		790000.000	UGL
59.2	07-jun-1990	TT10	SO4		700000.000	UGL
59.2	03-may-1990	UM20	12DCLE		0.824	UGL
59.2	03-may-1990	UM20	CCL4		11.400	UGL
59.2	07-jun-1990	UM20	CCL4		19.000	UGL
59.2	03-may-1990	UM20	CHCL3		21.500	UGL
59.2	07-jun-1990	UM20	CHCL3		41.000	UGL
59.2	03-may-1990	UM20	TRCLE		114.000	UGL
59.2	07-jun-1990	UM20	TRCLE		190.000	UGL
59.2	07-jun-1990	UW14	135TNB		0.867	UGL

Site: WELL TNT-12-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.3	25-apr-1990	99	TDS		1180000.000	UGL
50.3	07-jun-1990	99	TDS		1150000.000	UGL
50.3	25-apr-1990	SD21	SE		3.410	UGL
50.3	25-apr-1990	SD22	AS		28.400	UGL
50.3	25-apr-1990	TT10	CL		77000.000	UGL
50.3	07-jun-1990	TT10	CL		82000.000	UGL
50.3	25-apr-1990	TT10	SO4		380000.000	UGL
50.3	07-jun-1990	TT10	SO4		400000.000	UGL
50.3	07-jun-1990	UM20	CHCL3		0.749	UGL
50.3	07-jun-1990	UM20	TRCLE		0.819	UGL
50.3	07-jun-1990	UW14	135TNB		1.120	UGL
50.3	07-jun-1990	UW14	246NT		0.769	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: WELL TNT-13-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
52.2	01-may-1990	99	TDS		892000.000	UGL
52.2	07-jun-1990	99	TDS		918000.000	UGL
52.2	07-jun-1990	SB01	HG		0.526	UGL
52.2	07-jun-1990	SD20	PB		9.440	UGL
52.2	01-may-1990	SD22	AS		13.600	UGL
52.2	01-may-1990	TT10	CL		55000.000	UGL
52.2	07-jun-1990	TT10	CL		60000.000	UGL
52.2	01-may-1990	TT10	SO4		230000.000	UGL
52.2	07-jun-1990	TT10	SO4		228000.000	UGL
52.2	07-jun-1990	UM20	CHCL3		0.533	UGL
52.2	07-jun-1990	UM20	TRCLE		9.520	UGL

Site: WELL TNT-14-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
49.5	24-apr-1990	99	TDS		1030000.000	UGL
49.5	03-jun-1990	99	TDS		938000.000	UGL
49.5	24-apr-1990	SB01	HG		0.402	UGL
49.5	24-apr-1990	SD21	SE		46.600	UGL
49.5	03-jun-1990	SD21	SE		52.200	UGL
49.5	24-apr-1990	SD22	AS		31.400	UGL
49.5	03-jun-1990	SD22	AS		27.300	UGL
49.5	24-apr-1990	TT10	CL		66000.000	UGL
49.5	24-apr-1990	TT10	SO4		132000.000	UGL
49.5	24-apr-1990	UW14	135TNB		11.900	UGL
49.5	03-jun-1990	UW14	135TNB		13.500	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: WELL TNT-15-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
52.0	02-may-1990	99	TDS		1310000.000	UGL
52.0	02-jun-1990	99	TDS		1320000.000	UGL
52.0	02-may-1990	SD21	SE		7.450	UGL
52.0	02-jun-1990	SD21	SE		7.370	UGL
52.0	02-may-1990	SD22	AS		8.850	UGL
52.0	02-jun-1990	SD22	AS		7.140	UGL
52.0	02-may-1990	TT10	CL		290000.000	UGL
52.0	02-jun-1990	TT10	CL		210000.000	UGL
52.0	02-may-1990	TT10	SO4		400000.000	UGL
52.0	02-jun-1990	TT10	SO4		280000.000	UGL
52.0	02-jun-1990	UW14	RDX		6.720	UGL

Site: WELL TNT-16-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.7	02-may-1990	99	TDS		658000.000	UGL
56.7	02-jun-1990	99	TDS		692000.000	UGL
56.7	02-may-1990	SD22	AS		7.360	UGL
56.7	02-jun-1990	SD22	AS		8.740	UGL
56.7	02-may-1990	TT10	CL		66000.000	UGL
56.7	02-jun-1990	TT10	CL		66000.000	UGL
56.7	02-may-1990	TT10	SO4		220000.000	UGL
56.7	02-jun-1990	TT10	SO4		220000.000	UGL

Program ended normally.$

INSTALLATION RESTORATION PROGRAM

CHEMICAL REPORT
Sun Sep 9 13:14:54 1990

For Parameters :

Installation = Sierra Ordnance Depot
Beginning Date = 01-jan-75
Ending Date = 09/07/90
Media Type = Chemical Soil (CSO)
Maximum (X, Y) = (746167, 4460707)
Minimum (X, Y) = (736000, 4441000)
Booleans = N

Analytical Results for Chemical Soil

From: 01-jan-75 To: 09/07/90

(Booleans LT and ND are excluded)

Site: BORE ALF-01-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	13-mar-1990	99	PHENOL		0.195	UGG
10.0	17-mar-1990	99	PHENOL		0.190	UGG
20.0	17-mar-1990	99	PHENOL		0.225	UGG
25.0	17-mar-1990	99	PHENOL		1.840	UGG
35.0	17-mar-1990	99	PHENOL		0.129	UGG
70.0	17-mar-1990	99	PHENOL		0.380	UGG
80.0	17-mar-1990	99	PHENOL		0.114	UGG
90.0	17-mar-1990	99	PHENOL		0.625	UGG
95.0	17-mar-1990	99	PHENOL		0.130	UGG
50.0	17-mar-1990	99	PHENOL		0.449	UGG
5.0	13-mar-1990	JD19	AS		7.110	UGG
10.0	17-mar-1990	JD19	AS		9.500	UGG
15.0	17-mar-1990	JD19	AS		6.490	UGG
20.0	17-mar-1990	JD19	AS		8.490	UGG
25.0	17-mar-1990	JD19	AS		3.810	UGG
30.0	17-mar-1990	JD19	AS		8.130	UGG
35.0	17-mar-1990	JD19	AS		10.100	UGG
40.0	17-mar-1990	JD19	AS		3.710	UGG
45.0	17-mar-1990	JD19	AS		1.300	UGG
50.0	17-mar-1990	JD19	AS		1.400	UGG
60.0	17-mar-1990	JD19	AS		6.120	UGG
70.0	17-mar-1990	JD19	AS		3.050	UGG
80.0	17-mar-1990	JD19	AS		3.590	UGG
90.0	17-mar-1990	JD19	AS		4.180	UGG
95.0	17-mar-1990	JD19	AS		2.790	UGG
50.0	17-mar-1990	JD19	AS		1.360	UGG
15.0	17-mar-1990	JS11	CR		37.600	UGG
15.0	17-mar-1990	JS11	NI		36.000	UGG
40.0	17-mar-1990	JS11	PB		23.000	UGG
45.0	17-mar-1990	JS11	PB		10.300	UGG
90.0	17-mar-1990	JS11	PB		131.000	UGG
95.0	17-mar-1990	JS11	PB		311.000	UGG
10.0	17-mar-1990	JS11	ZN		95.400	UGG
15.0	17-mar-1990	JS11	ZN		143.000	UGG
20.0	17-mar-1990	JS11	ZN		105.000	UGG
90.0	17-mar-1990	JS11	ZN		95.800	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE ALF-02-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	13-mar-1990	99	PHENOL		0.113	UGG
10.0	18-mar-1990	99	PHENOL		0.276	UGG
30.0	18-mar-1990	99	PHENOL		0.233	UGG
35.0	18-mar-1990	99	PHENOL		0.192	UGG
40.0	18-mar-1990	99	PHENOL		0.152	UGG
45.0	18-mar-1990	99	PHENOL		0.112	UGG
70.0	18-mar-1990	99	PHENOL		0.175	UGG
80.0	18-mar-1990	99	PHENOL		0.200	UGG
89.0	18-mar-1990	99	PHENOL		0.235	UGG
30.0	18-mar-1990	JD15	SE		0.481	UGG
5.0	13-mar-1990	JD19	AS		9.900	UGG
10.0	18-mar-1990	JD19	AS		3.600	UGG
15.0	18-mar-1990	JD19	AS		4.600	UGG
20.0	18-mar-1990	JD19	AS		3.700	UGG
25.0	18-mar-1990	JD19	AS		2.700	UGG
30.0	18-mar-1990	JD19	AS		14.000	UGG
35.0	18-mar-1990	JD19	AS		3.500	UGG
40.0	18-mar-1990	JD19	AS		4.800	UGG
45.0	18-mar-1990	JD19	AS		1.500	UGG
50.0	18-mar-1990	JD19	AS		2.500	UGG
60.0	18-mar-1990	JD19	AS		6.600	UGG
70.0	18-mar-1990	JD19	AS		4.400	UGG
80.0	18-mar-1990	JD19	AS		4.000	UGG
89.0	18-mar-1990	JD19	AS		2.700	UGG
50.0	18-mar-1990	JD19	AS		1.590	UGG
10.0	18-mar-1990	JS11	PB		55.400	UGG
15.0	18-mar-1990	JS11	PB		7.080	UGG
30.0	18-mar-1990	JS11	PB		82.500	UGG
35.0	18-mar-1990	JS11	PB		33.000	UGG
40.0	18-mar-1990	JS11	PB		15.700	UGG
50.0	18-mar-1990	JS11	PB		12.200	UGG
60.0	18-mar-1990	JS11	PB		23.500	UGG
70.0	18-mar-1990	JS11	PB		131.000	UGG
80.0	18-mar-1990	JS11	PB		62.100	UGG
30.0	18-mar-1990	JS11	ZN		105.000	UGG
70.0	18-mar-1990	JS11	ZN		83.100	UGG
80.0	18-mar-1990	JS11	ZN		81.700	UGG
20.0	18-mar-1990	LH10	HPCL		0.011	UGG
50.0	18-mar-1990	LM19	MEC6H5		0.001	UGG
50.0	18-mar-1990	LM19	UNK071		0.315	UGG
50.0	18-mar-1990	LM19	UNK076		0.021	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE ALF-03-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	13-mar-1990	99	PHENOL		0.254	UGG
10.0	19-mar-1990	99	PHENOL		0.303	UGG
15.0	19-mar-1990	99	PHENOL		0.121	UGG
20.0	19-mar-1990	99	PHENOL		0.157	UGG
25.0	19-mar-1990	99	PHENOL		0.112	UGG
40.0	19-mar-1990	99	PHENOL		0.122	UGG
90.0	19-mar-1990	99	PHENOL		0.133	UGG
5.0	13-mar-1990	JD15	SE		0.441	UGG
30.0	19-mar-1990	JD15	SE		0.535	UGG
5.0	13-mar-1990	JD19	AS		11.000	UGG
10.0	19-mar-1990	JD19	AS		3.900	UGG
15.0	19-mar-1990	JD19	AS		2.900	UGG
20.0	19-mar-1990	JD19	AS		3.400	UGG
25.0	19-mar-1990	JD19	AS		4.700	UGG
30.0	19-mar-1990	JD19	AS		15.000	UGG
35.0	19-mar-1990	JD19	AS		9.800	UGG
40.0	19-mar-1990	JD19	AS		5.500	UGG
45.0	19-mar-1990	JD19	AS		3.300	UGG
50.0	19-mar-1990	JD19	AS		1.300	UGG
60.0	19-mar-1990	JD19	AS		3.900	UGG
70.0	19-mar-1990	JD19	AS		2.200	UGG
80.0	19-mar-1990	JD19	AS		4.200	UGG
90.0	19-mar-1990	JD19	AS		5.200	UGG
50.0	19-mar-1990	JD19	AS		0.794	UGG
10.0	19-mar-1990	JS11	PB		37.800	UGG
30.0	19-mar-1990	JS11	ZN		88.800	UGG
10.0	19-mar-1990	JS11	ZN		132.000	UGG
20.0	19-mar-1990	LH10	HPCL		0.007	UGG
45.0	19-mar-1990	LM19	ACET		0.024	UGG
5.0	13-mar-1990	LM19	CCL3F		0.015	UGG
50.0	19-mar-1990	LM19	MEC6H5		0.001	UGG
5.0	13-mar-1990	LM19	TRCLE		0.019	UGG
10.0	19-mar-1990	LM19	TRCLE		0.003	UGG
50.0	19-mar-1990	LM19	UNK071		0.206	UGG
50.0	19-mar-1990	LM19	UNK076		0.021	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE ALF-04-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
30.0	18-mar-1990	JD15	SE		0.444	UGG
5.0	13-mar-1990	JD19	AS		23.000	UGG
10.0	18-mar-1990	JD19	AS		4.800	UGG
15.0	18-mar-1990	JD19	AS		3.100	UGG
20.0	18-mar-1990	JD19	AS		4.100	UGG
25.0	18-mar-1990	JD19	AS		4.900	UGG
30.0	18-mar-1990	JD19	AS		14.000	UGG
35.0	18-mar-1990	JD19	AS		3.900	UGG
40.0	18-mar-1990	JD19	AS		2.300	UGG
45.0	18-mar-1990	JD19	AS		1.800	UGG
50.0	19-mar-1990	JD19	AS		2.600	UGG
60.0	19-mar-1990	JD19	AS		5.900	UGG
70.0	19-mar-1990	JD19	AS		8.800	UGG
80.0	19-mar-1990	JD19	AS		4.900	UGG
85.0	19-mar-1990	JD19	AS		6.100	UGG
50.0	19-mar-1990	JD19	AS		1.410	UGG
30.0	18-mar-1990	JS11	ZN		89.100	UGG
85.0	19-mar-1990	JS11	ZN		59.600	UGG
70.0	19-mar-1990	LM19	ACET		0.022	UGG
85.0	19-mar-1990	LM19	MEC6H5		0.002	UGG
5.0	13-mar-1990	LM19	UNK070		0.010	UGG
85.0	19-mar-1990	LM19	UNK071		0.222	UGG
85.0	19-mar-1990	LM19	UNK076		0.033	UGG

Site: BORE CCB-01-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
15.0	13-apr-1990	99	PHENOL		0.175	UGG
25.0	13-apr-1990	99	PHENOL		0.110	UGG
60.0	13-apr-1990	99	PHENOL		4.440	UGG
70.0	13-apr-1990	99	PHENOL		4.600	UGG
5.0	14-mar-1990	JD19	AS		3.490	UGG
50.0	13-apr-1990	JD19	AS		3.130	UGG
10.0	13-apr-1990	JD19	AS		4.890	UGG
15.0	13-apr-1990	JD19	AS		4.740	UGG
20.0	13-apr-1990	JD19	AS		2.700	UGG
25.0	13-apr-1990	JD19	AS		10.100	UGG
30.0	13-apr-1990	JD19	AS		8.040	UGG
35.0	13-apr-1990	JD19	AS		2.190	UGG
40.0	13-apr-1990	JD19	AS		2.070	UGG
45.0	13-apr-1990	JD19	AS		2.930	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE CCB-01-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.0	13-apr-1990	JD19	AS		3.470	UGG
60.0	13-apr-1990	JD19	AS		4.740	UGG
70.0	13-apr-1990	JD19	AS		13.000	UGG
88.0	13-apr-1990	JD19	AS		3.650	UGG
5.0	14-mar-1990	LH10	CLDAN		1.040	UGG
5.0	14-mar-1990	LH10	HPCL		0.007	UGG
5.0	14-mar-1990	LH10	HPCLE		0.006	UGG
5.0	14-mar-1990	LM19	CCL3F		0.009	UGG
25.0	13-apr-1990	LM19	UNK170		0.010	UGG
30.0	13-apr-1990	LM19	UNK170		0.007	UGG
35.0	13-apr-1990	LM19	UNK170		0.010	UGG
40.0	13-apr-1990	LM19	UNK170		0.010	UGG
45.0	13-apr-1990	LM19	UNK170		0.007	UGG
70.0	13-apr-1990	LM19	UNK170		0.009	UGG
88.0	13-apr-1990	LM19	UNK171		0.007	UGG
35.0	13-apr-1990	LM19	UNK175		0.008	UGG

Site: BORE CCB-02-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
10.0	12-apr-1990	99	PHENOL		0.222	UGG
15.0	12-apr-1990	99	PHENOL		0.110	UGG
20.0	12-apr-1990	99	PHENOL		0.103	UGG
25.0	12-apr-1990	99	PHENOL		0.107	UGG
60.0	12-apr-1990	99	PHENOL		0.115	UGG
70.0	13-apr-1990	99	PHENOL		0.208	UGG
80.0	13-apr-1990	99	PHENOL		0.160	UGG
5.0	14-mar-1990	JD19	AS		2.550	UGG
20.0	12-apr-1990	JD19	AS		4.820	UGG
10.0	12-apr-1990	JD19	AS		4.310	UGG
15.0	12-apr-1990	JD19	AS		4.700	UGG
20.0	12-apr-1990	JD19	AS		4.890	UGG
25.0	12-apr-1990	JD19	AS		7.650	UGG
30.0	12-apr-1990	JD19	AS		11.600	UGG
35.0	12-apr-1990	JD19	AS		2.300	UGG
40.0	12-apr-1990	JD19	AS		1.850	UGG
45.0	12-apr-1990	JD19	AS		21.000	UGG
50.0	12-apr-1990	JD19	AS		36.000	UGG
60.0	12-apr-1990	JD19	AS		3.130	UGG
80.0	13-apr-1990	JD19	AS		4.930	UGG
70.0	13-apr-1990	JD19	AS		2.970	UGG
80.0	13-apr-1990	JD19	AS		3.600	UGG

Site: BORE CCB-02-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
20.0	12-apr-1990	JS11	ZN		56.700	UGG
80.0	13-apr-1990	JS11	ZN		106.000	UGG
5.0	14-mar-1990	LH10	CLDAN		0.576	UGG
5.0	14-mar-1990	LH10	HPCL		0.007	UGG
5.0	14-mar-1990	LM19	CCL3F		0.008	UGG
80.0	13-apr-1990	LM19	UNK170		0.007	UGG
80.0	13-apr-1990	LM19	UNK170		0.008	UGG
70.0	13-apr-1990	LM19	UNK171		0.010	UGG
80.0	13-apr-1990	LM19	UNK176		0.008	UGG

Site: BORE CCB-03-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
10.0	12-apr-1990	99	PHENOL		2.190	UGG
50.0	12-apr-1990	99	PHENOL		0.198	UGG
60.0	12-apr-1990	99	PHENOL		0.264	UGG
70.0	12-apr-1990	99	PHENOL		0.125	UGG
80.0	12-apr-1990	99	PHENOL		0.148	UGG
5.0	14-mar-1990	JD19	AS		2.800	UGG
10.0	12-apr-1990	JD19	AS		15.000	UGG
15.0	12-apr-1990	JD19	AS		16.000	UGG
20.0	12-apr-1990	JD19	AS		6.360	UGG
25.0	12-apr-1990	JD19	AS		5.990	UGG
30.0	12-apr-1990	JD19	AS		19.000	UGG
35.0	12-apr-1990	JD19	AS		2.840	UGG
40.0	12-apr-1990	JD19	AS		3.320	UGG
45.0	12-apr-1990	JD19	AS		1.950	UGG
50.0	12-apr-1990	JD19	AS		15.000	UGG
60.0	12-apr-1990	JD19	AS		6.350	UGG
70.0	12-apr-1990	JD19	AS		7.800	UGG
80.0	12-apr-1990	JD19	AS		4.100	UGG
88.0	12-apr-1990	JD19	AS		5.480	UGG
35.0	12-apr-1990	JD19	AS		1.970	UGG
5.0	14-mar-1990	LM19	CCL3F		0.008	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE CCB-04-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
90.0	12-apr-1990	99	PHENOL		0.143	UGG
5.0	11-apr-1990	JD19	AS		13.000	UGG
50.0	11-apr-1990	JD19	AS		2.070	UGG
5.0	11-apr-1990	JD19	AS		10.200	UGG
10.0	11-apr-1990	JD19	AS		6.480	UGG
15.0	11-apr-1990	JD19	AS		3.720	UGG
20.0	11-apr-1990	JD19	AS		5.080	UGG
25.0	11-apr-1990	JD19	AS		5.720	UGG
30.0	11-apr-1990	JD19	AS		14.000	UGG
35.0	11-apr-1990	JD19	AS		5.790	UGG
40.0	11-apr-1990	JD19	AS		3.360	UGG
45.0	11-apr-1990	JD19	AS		1.920	UGG
50.0	11-apr-1990	JD19	AS		2.210	UGG
60.0	11-apr-1990	JD19	AS		2.340	UGG
70.0	12-apr-1990	JD19	AS		5.150	UGG
80.0	12-apr-1990	JD19	AS		2.670	UGG
90.0	12-apr-1990	JD19	AS		5.420	UGG
30.0	11-apr-1990	JS11	ZN		106.000	UGG
35.0	11-apr-1990	JS11	ZN		101.000	UGG
90.0	12-apr-1990	JS11	ZN		74.000	UGG

Site: BORE CCB-05-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
30.0	11-apr-1990	99	PHENOL		0.262	UGG
5.0	15-mar-1990	JD19	AS		6.390	UGG
10.0	11-apr-1990	JD19	AS		2.830	UGG
15.0	11-apr-1990	JD19	AS		3.280	UGG
20.0	11-apr-1990	JD19	AS		3.090	UGG
25.0	11-apr-1990	JD19	AS		1.780	UGG
30.0	11-apr-1990	JD19	AS		15.000	UGG
35.0	11-apr-1990	JD19	AS		4.910	UGG
40.0	11-apr-1990	JD19	AS		3.050	UGG
45.0	11-apr-1990	JD19	AS		1.250	UGG
50.0	11-apr-1990	JD19	AS		2.160	UGG
60.0	11-apr-1990	JD19	AS		2.900	UGG
30.0	11-apr-1990	JD19	AS		16.000	UGG
30.0	11-apr-1990	JS11	ZN		71.000	UGG
50.0	11-apr-1990	JS11	ZN		62.500	UGG
30.0	11-apr-1990	JS11	ZN		66.100	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE DNO-06-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
20.0	26-mar-1990	JD19	AS		5.840	UGG
25.0	26-mar-1990	JD19	AS		3.460	UGG
30.0	26-mar-1990	JD19	AS		1.470	UGG
35.0	26-mar-1990	JD19	AS		1.060	UGG
40.0	26-mar-1990	JD19	AS		6.280	UGG
45.0	26-mar-1990	JD19	AS		2.480	UGG
50.0	26-mar-1990	JD19	AS		4.170	UGG
60.0	26-mar-1990	JD19	AS		8.680	UGG
70.0	26-mar-1990	JD19	AS		5.290	UGG
80.0	26-mar-1990	JD19	AS		4.290	UGG
90.0	26-mar-1990	JD19	AS		7.960	UGG
95.0	26-mar-1990	JD19	AS		4.420	UGG
50.0	26-mar-1990	JD19	AS		6.830	UGG
10.0	26-mar-1990	JD19	AS		5.100	UGG
15.0	26-mar-1990	JD19	AS		17.000	UGG
10.0	26-mar-1990	JS11	BA		82.200	UGG
15.0	26-mar-1990	JS11	BA		392.000	UGG
20.0	26-mar-1990	JS11	BA		56.900	UGG
25.0	26-mar-1990	JS11	BA		118.000	UGG
30.0	26-mar-1990	JS11	BA		55.900	UGG
40.0	26-mar-1990	JS11	BA		111.000	UGG
45.0	26-mar-1990	JS11	BA		133.000	UGG
50.0	26-mar-1990	JS11	BA		204.000	UGG
60.0	26-mar-1990	JS11	BA		103.000	UGG
70.0	26-mar-1990	JS11	BA		250.000	UGG
80.0	26-mar-1990	JS11	BA		53.800	UGG
90.0	26-mar-1990	JS11	BA		228.000	UGG
95.0	26-mar-1990	JS11	BA		285.000	UGG
50.0	26-mar-1990	JS11	BA		215.000	UGG
15.0	26-mar-1990	JS11	CO		28.600	UGG
15.0	26-mar-1990	JS11	MO		2.590	UGG
70.0	26-mar-1990	JS11	MO		3.390	UGG
50.0	26-mar-1990	JS11	MO		5.960	UGG
15.0	26-mar-1990	JS11	PB		8.880	UGG
10.0	26-mar-1990	JS11	V		23.000	UGG
15.0	26-mar-1990	JS11	V		118.000	UGG
25.0	26-mar-1990	JS11	V		43.000	UGG
40.0	26-mar-1990	JS11	V		40.700	UGG
45.0	26-mar-1990	JS11	V		38.500	UGG
50.0	26-mar-1990	JS11	V		86.500	UGG
60.0	26-mar-1990	JS11	V		30.600	UGG
70.0	26-mar-1990	JS11	V		65.500	UGG
80.0	26-mar-1990	JS11	V		37.500	UGG
90.0	26-mar-1990	JS11	V		59.200	UGG
95.0	26-mar-1990	JS11	V		63.400	UGG
50.0	26-mar-1990	JS11	V		83.200	UGG
15.0	26-mar-1990	JS11	ZN		155.000	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE DMO-06-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.0	26-mar-1990	JS11	ZN		72.300	UGG
90.0	26-mar-1990	JS11	ZN		71.000	UGG
95.0	26-mar-1990	JS11	ZN		67.600	UGG
50.0	26-mar-1990	JS11	ZN		77.900	UGG
50.0	26-mar-1990	LM19	UNK071		0.023	UGG

Site: BORE DMO-07-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
10.0	26-mar-1990	JD19	AS		5.230	UGG
15.0	26-mar-1990	JD19	AS		6.520	UGG
20.0	26-mar-1990	JD19	AS		2.570	UGG
25.0	26-mar-1990	JD19	AS		6.550	UGG
30.0	26-mar-1990	JD19	AS		1.280	UGG
35.0	26-mar-1990	JD19	AS		1.510	UGG
5.0	26-mar-1990	JD19	AS		19.000	UGG
45.0	29-mar-1990	JD19	AS		3.820	UGG
50.0	29-mar-1990	JD19	AS		3.640	UGG
60.0	29-mar-1990	JD19	AS		14.000	UGG
70.0	29-mar-1990	JD19	AS		5.960	UGG
80.C	29-mar-1990	JD19	AS		6.060	UGG
90.0	29-mar-1990	JD19	AS		14.000	UGG
50.0	29-mar-1990	JD19	AS		6.130	UGG
90.0	29-mar-1990	JD19	AS		4.340	UGG
5.0	26-mar-1990	JS11	BA		410.000	UGG
10.0	26-mar-1990	JS11	BA		76.500	UGG
15.0	26-mar-1990	JS11	BA		269.000	UGG
20.0	26-mar-1990	JS11	BA		62.100	UGG
25.0	26-mar-1990	JS11	BA		113.000	UGG
30.0	26-mar-1990	JS11	BA		155.000	UGG
35.0	26-mar-1990	JS11	BA		54.400	UGG
80.0	29-mar-1990	JS11	BA		56.900	UGG
90.0	29-mar-1990	JS11	BA		136.000	UGG
45.0	29-mar-1990	JS11	BA		145.000	UGG
50.0	29-mar-1990	JS11	BA		259.000	UGG
60.0	29-mar-1990	JS11	BA		186.000	UGG
70.0	29-mar-1990	JS11	BA		144.000	UGG
50.0	29-mar-1990	JS11	BA		229.000	UGG
90.0	29-mar-1990	JS11	BA		172.000	UGG
25.0	26-mar-1990	JS11	MO		2.170	UGG
50.0	29-mar-1990	JS11	MO		2.470	UGG
70.0	29-mar-1990	JS11	MO		2.060	UGG
50.0	29-mar-1990	JS11	MO		2.290	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE DMO-07-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
90.0	29-mar-1990	JS11	PB		67.500	UGG
5.0	26-mar-1990	JS11	V		61.200	UGG
15.0	26-mar-1990	JS11	V		81.100	UGG
20.0	26-mar-1990	JS11	V		35.200	UGG
25.0	26-mar-1990	JS11	V		37.400	UGG
30.0	26-mar-1990	JS11	V		23.900	UGG
35.0	26-mar-1990	JS11	V		25.900	UGG
80.0	29-mar-1990	JS11	V		23.000	UGG
90.0	29-mar-1990	JS11	V		48.200	UGG
45.0	29-mar-1990	JS11	V		45.600	UGG
50.0	29-mar-1990	JS11	V		73.400	UGG
60.0	29-mar-1990	JS11	V		43.300	UGG
70.0	29-mar-1990	JS11	V		35.000	UGG
50.0	29-mar-1990	JS11	V		75.000	UGG
90.0	29-mar-1990	JS11	V		60.700	UGG
5.0	26-mar-1990	JS11	ZN		76.900	UGG
15.0	26-mar-1990	JS11	ZN		104.000	UGG
90.0	29-mar-1990	JS11	ZN		61.000	UGG
50.0	29-mar-1990	JS11	ZN		83.500	UGG
50.0	29-mar-1990	JS11	ZN		87.100	UGG
90.0	29-mar-1990	JS11	ZN		64.700	UGG
5.0	26-mar-1990	JY02	CRHEX		1.120	UGG
90.0	29-mar-1990	LN19	TRCLE		0.004	UGG
35.0	26-mar-1990	LN19	UNK071		0.021	UGG
25.0	26-mar-1990	LN19	UNK071		0.021	UGG
20.0	26-mar-1990	LN19	UNK071		0.010	UGG

Site: BORE DMO-08-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
25.0	27-mar-1990	99	HPCL		0.010	UGG
10.0	27-mar-1990	JB01	HG		0.086	UGG
5.0	27-mar-1990	JD19	AS		11.400	UGG
10.0	27-mar-1990	JD19	AS		5.520	UGG
15.0	27-mar-1990	JD19	AS		4.130	UGG
20.0	27-mar-1990	JD19	AS		4.090	UGG
25.0	27-mar-1990	JD19	AS		3.210	UGG
30.0	27-mar-1990	JD19	AS		2.220	UGG
35.0	27-mar-1990	JD19	AS		1.830	UGG
40.0	27-mar-1990	JD19	AS		4.410	UGG
45.0	27-mar-1990	JD19	AS		3.720	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE DMO-08-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.0	27-mar-1990	JD19	AS		4.670	UGG
60.0	27-mar-1990	JD19	AS		12.000	UGG
70.0	27-mar-1990	JD19	AS		9.270	UGG
80.0	27-mar-1990	JD19	AS		7.360	UGG
90.0	27-mar-1990	JD19	AS		6.240	UGG
95.0	27-mar-1990	JD19	AS		2.750	UGG
50.0	27-mar-1990	JD19	AS		4.910	UGG
5.0	27-mar-1990	JS11	BA		244.000	UGG
15.0	27-mar-1990	JS11	BA		163.000	UGG
25.0	27-mar-1990	JS11	BA		142.000	UGG
30.0	27-mar-1990	JS11	BA		73.200	UGG
35.0	27-mar-1990	JS11	BA		57.300	UGG
40.0	27-mar-1990	JS11	BA		110.000	UGG
45.0	27-mar-1990	JS11	BA		164.000	UGG
50.0	27-mar-1990	JS11	BA		121.000	UGG
60.0	27-mar-1990	JS11	BA		92.600	UGG
70.0	27-mar-1990	JS11	BA		128.000	UGG
90.0	27-mar-1990	JS11	BA		135.000	UGG
95.0	27-mar-1990	JS11	BA		198.000	UGG
50.0	27-mar-1990	JS11	BA		137.000	UGG
50.0	27-mar-1990	JS11	MO		2.380	UGG
60.0	27-mar-1990	JS11	MO		2.310	UGG
70.0	27-mar-1990	JS11	MO		2.240	UGG
50.0	27-mar-1990	JS11	MO		2.280	UGG
5.0	27-mar-1990	JS11	PB		7.500	UGG
25.0	27-mar-1990	JS11	PB		11.900	UGG
70.0	27-mar-1990	JS11	PB		13.600	UGG
90.0	27-mar-1990	JS11	PB		21.400	UGG
5.0	27-mar-1990	JS11	V		54.700	UGG
10.0	27-mar-1990	JS11	V		20.900	UGG
15.0	27-mar-1990	JS11	V		57.000	UGG
25.0	27-mar-1990	JS11	V		35.500	UGG
30.0	27-mar-1990	JS11	V		27.000	UGG
40.0	27-mar-1990	JS11	V		36.300	UGG
45.0	27-mar-1990	JS11	V		38.300	UGG
50.0	27-mar-1990	JS11	V		46.100	UGG
60.0	27-mar-1990	JS11	V		37.000	UGG
70.0	27-mar-1990	JS11	V		32.700	UGG
90.0	27-mar-1990	JS11	V		40.	UGG
95.0	27-mar-1990	JS11	V		51.500	UGG
50.0	27-mar-1990	JS11	V		57.800	UGG
5.0	27-mar-1990	JS11	ZN		66.800	UGG
15.0	27-mar-1990	JS11	ZN		67.900	UGG
45.0	27-mar-1990	JS11	ZN		59.200	UGG
95.0	27-mar-1990	JS11	ZN		62.500	UGG
50.0	27-mar-1990	JS11	ZN		58.200	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE DMO-08-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
35.0	27-mar-1990	LM19	MEC6H5		0.001	UGG
70.0	27-mar-1990	LM19	MEC6H5		0.001	UGG
5.0	27-mar-1990	LM19	TRCLE		0.019	UGG
15.0	27-mar-1990	LM19	UNK071		0.011	UGG
10.0	27-mar-1990	LM19	UNK071		0.021	UGG
5.0	27-mar-1990	LM19	UNK071		0.011	UGG

Site: BORE DMO-09-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	28-mar-1990	JD19	AS		14.000	UGG
10.0	28-mar-1990	JD19	AS		6.570	UGG
15.0	28-mar-1990	JD19	AS		6.990	UGG
20.0	28-mar-1990	JD19	AS		2.920	UGG
25.0	28-mar-1990	JD19	AS		1.730	UGG
30.0	28-mar-1990	JD19	AS		2.720	UGG
35.0	28-mar-1990	JD19	AS		1.650	UGG
40.0	28-mar-1990	JD19	AS		2.600	UGG
45.0	28-mar-1990	JD19	AS		3.360	UGG
50.0	28-mar-1990	JD19	AS		7.430	UGG
60.0	28-mar-1990	JD19	AS		5.840	UGG
70.0	28-mar-1990	JD19	AS		14.000	UGG
80.0	28-mar-1990	JD19	AS		3.490	UGG
90.0	28-mar-1990	JD19	AS		4.260	UGG
50.0	28-mar-1990	JD19	AS		7.360	UGG
5.0	28-mar-1990	JS11	BA		276.000	UGG
10.0	28-mar-1990	JS11	BA		106.000	UGG
15.0	28-mar-1990	JS11	BA		137.000	UGG
25.0	28-mar-1990	JS11	BA		135.000	UGG
30.0	28-mar-1990	JS11	BA		81.400	UGG
40.0	28-mar-1990	JS11	BA		90.900	UGG
45.0	28-mar-1990	JS11	BA		109.000	UGG
50.0	28-mar-1990	JS11	BA		180.000	UGG
60.0	28-mar-1990	JS11	BA		78.400	UGG
70.0	28-mar-1990	JS11	BA		221.000	UGG
80.0	28-mar-1990	JS11	BA		61.700	UGG
90.0	28-mar-1990	JS11	BA		195.000	UGG
50.0	28-mar-1990	JS11	BA		98.600	UGG
50.0	28-mar-1990	JS11	MO		2.800	UGG
70.0	28-mar-1990	JS11	MO		4.660	UGG
50.0	28-mar-1990	JS11	MO		2.280	UGG
25.0	28-mar-1990	JS11	PB		19.200	UGG
30.0	28-mar-1990	JS11	PB		21.700	UGG
50.0	28-mar-1990	JS11	PB		7.610	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE DMO-09-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
90.0	28-mar-1990	JS11	PB		8.580	UGG
5.0	28-mar-1990	JS11	V		53.300	UGG
10.0	28-mar-1990	JS11	V		30.200	UGG
15.0	28-mar-1990	JS11	V		52.100	UGG
25.0	28-mar-1990	JS11	V		44.400	UGG
30.0	28-mar-1990	JS11	V		36.200	UGG
35.0	28-mar-1990	JS11	V		22.600	UGG
40.0	28-mar-1990	JS11	V		26.700	UGG
45.0	28-mar-1990	JS11	V		35.700	UGG
50.0	28-mar-1990	JS11	V		51.000	UGG
60.0	28-mar-1990	JS11	V		33.400	UGG
70.0	28-mar-1990	JS11	V		57.000	UGG
80.0	28-mar-1990	JS11	V		49.400	UGG
90.0	28-mar-1990	JS11	V		60.100	UGG
50.0	28-mar-1990	JS11	V		34.600	UGG
5.0	28-mar-1990	JS11	ZN		71.800	UGG
25.0	28-mar-1990	JS11	ZN		58.400	UGG
50.0	28-mar-1990	JS11	ZN		60.300	UGG
90.0	28-mar-1990	JS11	ZN		64.300	UGG
5.0	28-mar-1990	JY02	CRHEX		0.729	UGG

Site: BORE DMO-10-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
90.0	29-mar-1990	JB01	HG		0.071	UGG
5.0	28-mar-1990	JD19	AS		9.270	UGG
50.0	28-mar-1990	JD19	AS		3.490	UGG
10.0	28-mar-1990	JD19	AS		8.900	UGG
15.0	28-mar-1990	JD19	AS		10.400	UGG
20.0	28-mar-1990	JD19	AS		6.460	UGG
25.0	28-mar-1990	JD19	AS		1.310	UGG
30.0	28-mar-1990	JD19	AS		1.360	UGG
40.0	28-mar-1990	JD19	AS		9.880	UGG
45.0	28-mar-1990	JD19	AS		2.850	UGG
50.0	28-mar-1990	JD19	AS		3.950	UGG
80.0	29-mar-1990	JD19	AS		4.210	UGG
60.0	29-mar-1990	JD19	AS		10.000	UGG
70.0	29-mar-1990	JD19	AS		2.780	UGG
80.0	29-mar-1990	JD19	AS		4.350	UGG
90.0	29-mar-1990	JD19	AS		10.800	UGG
5.0	28-mar-1990	JS11	BA		261.000	UGG
10.0	28-mar-1990	JS11	BA		148.000	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE DMO-10-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
15.0	28-mar-1990	JS11	BA		246.000	UGG
20.0	28-mar-1990	JS11	BA		73.600	UGG
30.0	28-mar-1990	JS11	BA		75.500	UGG
40.0	28-mar-1990	JS11	BA		139.000	UGG
45.0	28-mar-1990	JS11	BA		118.000	UGG
50.0	28-mar-1990	JS11	BA		205.000	UGG
50.0	28-mar-1990	JS11	BA		166.000	UGG
60.0	29-mar-1990	JS11	BA		470.000	UGG
70.0	29-mar-1990	JS11	BA		204.000	UGG
80.0	29-mar-1990	JS11	BA		95.100	UGG
90.0	29-mar-1990	JS11	BA		193.000	UGG
80.0	29-mar-1990	JS11	BA		153.000	UGG
5.0	28-mar-1990	JS11	MO		2.030	UGG
15.0	28-mar-1990	JS11	MO		5.310	UGG
40.0	28-mar-1990	JS11	MO		4.050	UGG
60.0	29-mar-1990	JS11	MO		3.340	UGG
5.0	28-mar-1990	JS11	PB		16.100	UGG
40.0	28-mar-1990	JS11	PB		9.500	UGG
60.0	29-mar-1990	JS11	PB		16.100	UGG
90.0	29-mar-1990	JS11	PB		17.700	UGG
5.0	28-mar-1990	JS11	V		49.800	UGG
10.0	28-mar-1990	JS11	V		34.700	UGG
15.0	28-mar-1990	JS11	V		65.800	UGG
20.0	28-mar-1990	JS11	V		24.000	UGG
30.0	28-mar-1990	JS11	V		32.400	UGG
40.0	28-mar-1990	JS11	V		48.900	UGG
45.0	28-mar-1990	JS11	V		36.900	UGG
50.0	28-mar-1990	JS11	V		55.100	UGG
50.0	28-mar-1990	JS11	V		50.700	UGG
60.0	29-mar-1990	JS11	V		102.000	UGG
70.0	29-mar-1990	JS11	V		67.400	UGG
80.0	29-mar-1990	JS11	V		46.800	UGG
90.0	29-mar-1990	JS11	V		69.100	UGG
80.0	29-mar-1990	JS11	V		55.600	UGG
5.0	28-mar-1990	JS11	ZN		142.000	UGG
15.0	28-mar-1990	JS11	ZN		73.300	UGG
50.0	28-mar-1990	JS11	ZN		58.600	UGG
60.0	29-mar-1990	JS11	ZN		103.000	UGG
70.0	29-mar-1990	JS11	ZN		66.100	UGG
90.0	29-mar-1990	JS11	ZN		62.400	UGG
80.0	29-mar-1990	JS11	ZN		58.300	UGG
5.0	28-mar-1990	JY02	CRHEX		1.230	UGG
10.0	28-mar-1990	LH10	HPCL		0.007	UGG
60.0	29-mar-1990	LM19	CH2CL2		0.197	UGG
70.0	29-mar-1990	LM19	CH2CL2		0.032	UGG

Site: BORE DMO-10-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	28-mar-1990	LM19	TRCLE		0.006	UGG
60.0	29-mar-1990	LM19	TRCLE		0.210	UGG
70.0	29-mar-1990	LM19	TRCLE		0.089	UGG
90.0	29-mar-1990	LM19	TRCLE		0.016	UGG
60.0	29-mar-1990	LM19	UNK129		0.024	UGG

Site: BORE DMO-11-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
45.0	30-mar-1990	JD19	AS		2.570	UGG
5.0	30-mar-1990	JD19	AS		11.000	UGG
10.0	30-mar-1990	JD19	AS		9.240	UGG
15.0	30-mar-1990	JD19	AS		5.090	UGG
20.0	30-mar-1990	JD19	AS		8.410	UGG
25.0	30-mar-1990	JD19	AS		7.960	UGG
30.0	30-mar-1990	JD19	AS		2.740	UGG
35.0	30-mar-1990	JD19	AS		9.270	UGG
40.0	30-mar-1990	JD19	AS		5.070	UGG
45.0	30-mar-1990	JD19	AS		3.170	UGG
50.0	30-mar-1990	JD19	AS		2.700	UGG
60.0	30-mar-1990	JD19	AS		6.100	UGG
70.0	30-mar-1990	JD19	AS		3.110	UGG
80.0	30-mar-1990	JD19	AS		4.240	UGG
90.0	30-mar-1990	JD19	AS		3.410	UGG
5.0	30-mar-1990	JS11	BA		257.000	UGG
10.0	30-mar-1990	JS11	BA		225.000	UGG
15.0	30-mar-1990	JS11	BA		299.000	UGG
20.0	30-mar-1990	JS11	BA		130.000	UGG
25.0	30-mar-1990	JS11	BA		215.000	UGG
30.0	30-mar-1990	JS11	BA		121.000	UGG
40.0	30-mar-1990	JS11	BA		86.800	UGG
45.0	30-mar-1990	JS11	BA		201.000	UGG
50.0	30-mar-1990	JS11	BA		64.200	UGG
60.0	30-mar-1990	JS11	BA		135.000	UGG
70.0	30-mar-1990	JS11	BA		226.000	UGG
80.0	30-mar-1990	JS11	BA		58.200	UGG
90.0	30-mar-1990	JS11	BA		85.600	UGG
45.0	30-mar-1990	JS11	BA		251.000	UGG
5.0	30-mar-1990	JS11	MO		1.920	UGG
15.0	30-mar-1990	JS11	MO		2.090	UGG
20.0	30-mar-1990	JS11	MO		3.640	UGG
25.0	30-mar-1990	JS11	MO		2.150	UGG
60.0	30-mar-1990	JS11	MO		2.510	UGG
70.0	30-mar-1990	JS11	MO		2.150	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE DNO-11-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	30-mar-1990	JS11	PB		14.400	UGG
10.0	30-mar-1990	JS11	PB		10.700	UGG
15.0	30-mar-1990	JS11	PB		9.600	UGG
20.0	30-mar-1990	JS11	PB		8.060	UGG
5.0	30-mar-1990	JS11	V		43.300	UGG
10.0	30-mar-1990	JS11	V		44.300	UGG
15.0	30-mar-1990	JS11	V		99.300	UGG
20.0	30-mar-1990	JS11	V		50.500	UGG
25.0	30-mar-1990	JS11	V		72.400	UGG
30.0	30-mar-1990	JS11	V		35.200	UGG
40.0	30-mar-1990	JS11	V		29.500	UGG
45.0	30-mar-1990	JS11	V		53.700	UGG
50.0	30-mar-1990	JS11	V		35.800	UGG
60.0	30-mar-1990	JS11	V		67.600	UGG
70.0	30-mar-1990	JS11	V		77.400	UGG
80.0	30-mar-1990	JS11	V		53.300	UGG
90.0	30-mar-1990	JS11	V		30.500	UGG
45.0	30-mar-1990	JS11	V		62.700	UGG
10.0	30-mar-1990	JS11	ZN		64.700	UGG
15.0	30-mar-1990	JS11	ZN		124.000	UGG
25.0	30-mar-1990	JS11	ZN		65.100	UGG
45.0	30-mar-1990	JS11	ZN		68.100	UGG
70.0	30-mar-1990	JS11	ZN		73.500	UGG
45.0	30-mar-1990	JS11	ZN		78.100	UGG
15.0	30-mar-1990	LH10	ALDRN		0.058	UGG
15.0	30-mar-1990	LH10	PPDDD		2.200	UGG
15.0	30-mar-1990	LH10	PPDDE		0.024	UGG
15.0	30-mar-1990	LH10	PPDDT		2.530	UGG
20.0	30-mar-1990	LH10	PPDDT		0.014	UGG
80.0	30-mar-1990	LM18	12EPCH		0.108	UGG
90.0	30-mar-1990	LM18	12EPCH		0.105	UGG
90.0	30-mar-1990	LM18	MEC6H5		0.105	UGG
15.0	30-mar-1990	LM19	111TCE	GT	1.000	UGG
15.0	30-mar-1990	LM19	113MCH		3.890	UGG
15.0	30-mar-1990	LM19	11DCE		0.156	UGG
15.0	30-mar-1990	LM19	12DCLE		0.109	UGG
15.0	30-mar-1990	LM19	12DCLP		0.051	UGG
15.0	30-mar-1990	LM19	C6H6		1.090	UGG
25.0	30-mar-1990	LM19	CH2CL2		0.014	UGG
15.0	30-mar-1990	LM19	CH2CL2		0.562	UGG
15.0	30-mar-1990	LM19	CHCL3		0.054	UGG
15.0	30-mar-1990	LM19	CL2B2		222.000	UGG
15.0	30-mar-1990	LM19	CLC6H5	GT	1.000	UGG
15.0	30-mar-1990	LM19	ETC6H5	GT	1.000	UGG
15.0	30-mar-1990	LM19	MEC6H5	GT	1.000	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE DHO-11-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
15.0	30-mar-1990	LM19	MECYPE		0.555	UGG
15.0	30-mar-1990	LM19	TCLEA	GT	1.000	UGG
15.0	30-mar-1990	LM19	TCLEE	GT	1.000	UGG
25.0	30-mar-1990	LM19	TRCLE		0.028	UGG
15.0	30-mar-1990	LM19	TRCLE	GT	1.000	UGG
5.0	30-mar-1990	LM19	UNK076		0.007	UGG
25.0	30-mar-1990	LM19	UNK092		0.012	UGG
30.0	30-mar-1990	LM19	UNK092		0.021	UGG
15.0	30-mar-1990	LM19	UNK094		0.389	UGG
15.0	30-mar-1990	LM19	UNK098		1.110	UGG
15.0	30-mar-1990	LM19	UNK103		0.555	UGG
15.0	30-mar-1990	LM19	UNK115		2.220	UGG
50.0	30-mar-1990	LM19	UNK128		0.007	UGG
60.0	30-mar-1990	LM19	UNK128		0.022	UGG
15.0	30-mar-1990	LM19	UNK128		0.555	UGG
15.0	30-mar-1990	LM19	UNK138		3.330	UGG
15.0	30-mar-1990	LM19	UNK143		0.555	UGG
15.0	30-mar-1990	LM19	XYLEN	GT	1.000	UGG

Site: BORE DHO-12-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	20-mar-1990	JD19	AS		23.000	UGG
10.0	20-mar-1990	JD19	AS		3.860	UGG
15.0	20-mar-1990	JD19	AS		6.310	UGG
20.0	20-mar-1990	JD19	AS		6.150	UGG
25.0	20-mar-1990	JD19	AS		1.560	UGG
30.0	20-mar-1990	JD19	AS		4.170	UGG
35.0	20-mar-1990	JD19	AS		1.840	UGG
40.0	20-mar-1990	JD19	AS		9.150	UGG
45.0	20-mar-1990	JD19	AS		3.880	UGG
50.0	20-mar-1990	JD19	AS		7.630	UGG
60.0	20-mar-1990	JD19	AS		3.870	UGG
70.0	20-mar-1990	JD19	AS		4.070	UGG
80.0	20-mar-1990	JD19	AS		4.540	UGG
90.0	20-mar-1990	JD19	AS		4.860	UGG
95.0	20-mar-1990	JD19	AS		3.550	UGG
20.0	20-mar-1990	JD19	AS		4.630	UGG
5.0	20-mar-1990	JS11	BA		330.000	UGG
10.0	20-mar-1990	JS11	BA		69.200	UGG
15.0	20-mar-1990	JS11	BA		121.000	UGG
20.0	20-mar-1990	JS11	BA		111.000	UGG
25.0	20-mar-1990	JS11	BA		84.000	UGG
40.0	20-mar-1990	JS11	BA		217.000	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE DHO-12-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
45.0	20-mar-1990	JS11	BA		159.000	UGG
50.0	20-mar-1990	JS11	BA		195.000	UGG
20.0	20-mar-1990	JS11	BA		53.400	UGG
60.0	20-mar-1990	JS11	BA		290.000	UGG
70.0	20-mar-1990	JS11	BA		139.000	UGG
80.0	20-mar-1990	JS11	BA		76.700	UGG
90.0	20-mar-1990	JS11	BA		152.000	UGG
95.0	20-mar-1990	JS11	BA		342.000	UGG
5.0	20-mar-1990	JS11	MO		2.260	UGG
20.0	20-mar-1990	JS11	MO		2.720	UGG
40.0	20-mar-1990	JS11	MO		2.700	UGG
50.0	20-mar-1990	JS11	MO		2.130	UGG
40.0	20-mar-1990	JS11	PB		21.800	UGG
5.0	20-mar-1990	JS11	V		39.200	UGG
10.0	20-mar-1990	JS11	V		23.100	UGG
15.0	20-mar-1990	JS11	V		33.900	UGG
20.0	20-mar-1990	JS11	V		35.300	UGG
25.0	20-mar-1990	JS11	V		28.100	UGG
40.0	20-mar-1990	JS11	V		61.800	UGG
45.0	20-mar-1990	JS11	V		40.600	UGG
50.0	20-mar-1990	JS11	V		54.200	UGG
20.0	20-mar-1990	JS11	V		22.400	UGG
60.0	20-mar-1990	JS11	V		80.000	UGG
70.0	20-mar-1990	JS11	V		49.900	UGG
80.0	20-mar-1990	JS11	V		47.300	UGG
90.0	20-mar-1990	JS11	V		56.000	UGG
95.0	20-mar-1990	JS11	V		79.800	UGG
40.0	20-mar-1990	JS11	ZN		68.500	UGG
50.0	20-mar-1990	JS11	ZN		65.700	UGG
60.0	20-mar-1990	JS11	ZN		83.700	UGG
90.0	20-mar-1990	JS11	ZN		63.400	UGG
95.0	20-mar-1990	JS11	ZN		90.300	UGG
40.0	20-mar-1990	LM19	ACET		0.020	UGG
40.0	20-mar-1990	LM19	B2CLEE		0.034	UGG
45.0	20-mar-1990	LM19	B2CLEE		0.021	UGG
60.0	20-mar-1990	LM19	B2CLEE		0.116	UGG
5.0	20-mar-1990	LM19	MEC6H5		0.001	UGG
10.0	20-mar-1990	LM19	MEC6H5		0.001	UGG
15.0	20-mar-1990	LM19	MEC6H5		0.001	UGG
20.0	20-mar-1990	LM19	MEC6H5		0.001	UGG
5.0	20-mar-1990	LM19	UNK071		0.108	UGG
10.0	20-mar-1990	LM19	UNK071		0.105	UGG
15.0	20-mar-1990	LM19	UNK071		0.207	UGG
20.0	20-mar-1990	LM19	UNK071		0.104	UGG
5.0	20-mar-1990	LM19	UNK076		0.011	UGG
10.0	20-mar-1990	LM19	UNK076		0.010	UGG
15.0	20-mar-1990	LM19	UNK076		0.021	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE DMO-12-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
20.0	20-mar-1990	LM19	UNK076		0.010	UGG

Site: BORE DMO-13-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	20-mar-1990	JD19	AS		19.000	UGG
10.0	20-mar-1990	JD19	AS		2.410	UGG
15.0	20-mar-1990	JD19	AS		10.100	UGG
20.0	20-mar-1990	JD19	AS		3.570	UGG
25.0	20-mar-1990	JD19	AS		3.060	UGG
30.0	20-mar-1990	JD19	AS		3.380	UGG
35.0	20-mar-1990	JD19	AS		1.210	UGG
40.0	20-mar-1990	JD19	AS		7.930	UGG
45.0	20-mar-1990	JD19	AS		3.100	UGG
50.0	20-mar-1990	JD19	AS		3.440	UGG
60.0	20-mar-1990	JD19	AS		4.110	UGG
70.0	20-mar-1990	JD19	AS		8.250	UGG
80.0	20-mar-1990	JD19	AS		7.930	UGG
90.0	20-mar-1990	JD19	AS		8.130	UGG
95.0	20-mar-1990	JD19	AS		2.820	UGG
50.0	20-mar-1990	JD19	AS		3.210	UGG
5.0	20-mar-1990	JS11	BA		410.000	UGG
15.0	20-mar-1990	JS11	BA		376.000	UGG
20.0	20-mar-1990	JS11	BA		61.000	UGG
25.0	20-mar-1990	JS11	BA		122.000	UGG
40.0	20-mar-1990	JS11	BA		173.000	UGG
45.0	20-mar-1990	JS11	BA		144.000	UGG
50.0	20-mar-1990	JS11	BA		119.000	UGG
60.0	20-mar-1990	JS11	BA		300.000	UGG
70.0	20-mar-1990	JS11	BA		204.000	UGG
50.0	20-mar-1990	JS11	BA		122.000	UGG
80.0	20-mar-1990	JS11	BA		145.000	UGG
90.0	20-mar-1990	JS11	BA		234.000	UGG
95.0	20-mar-1990	JS11	BA		370.000	UGG
5.0	20-mar-1990	JS11	MO		3.470	UGG
15.0	20-mar-1990	JS11	MO		2.690	UGG
40.0	20-mar-1990	JS11	MO		2.890	UGG
70.0	20-mar-1990	JS11	MO		3.410	UGG
15.0	20-mar-1990	JS11	PB		17.800	UGG
95.0	20-mar-1990	JS11	PB		11.600	UGG
5.0	20-mar-1990	JS11	V		66.900	UGG
15.0	20-mar-1990	JS11	V		106.000	UGG
20.0	20-mar-1990	JS11	V		23.700	UGG
25.0	20-mar-1990	JS11	V		42.700	UGG

Site: BORE DMO-13-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
40.0	20-mar-1990	JS11	V		48.800	UGG
45.0	20-mar-1990	JS11	V		44.600	UGG
50.0	20-mar-1990	JS11	V		28.300	UGG
60.0	20-mar-1990	JS11	V		78.500	UGG
70.0	20-mar-1990	JS11	V		43.900	UGG
50.0	20-mar-1990	JS11	V		44.100	UGG
80.0	20-mar-1990	JS11	V		64.000	UGG
90.0	20-mar-1990	JS11	V		58.600	UGG
95.0	20-mar-1990	JS11	V		84.500	UGG
5.0	20-mar-1990	JS11	ZN		80.300	UGG
15.0	20-mar-1990	JS11	ZN		151.000	UGG
40.0	20-mar-1990	JS11	ZN		57.700	UGG
45.0	20-mar-1990	JS11	ZN		57.900	UGG
60.0	20-mar-1990	JS11	ZN		81.900	UGG
80.0	20-mar-1990	JS11	ZN		67.300	UGG
90.0	20-mar-1990	JS11	ZN		88.200	UGG
95.0	20-mar-1990	JS11	ZN		96.300	UGG
10.0	20-mar-1990	LN10	HPCL		0.008	UGG
70.0	20-mar-1990	LM19	B2CLEE		0.011	UGG
25.0	20-mar-1990	LM19	UNK055		0.011	UGG
50.0	20-mar-1990	LM19	UNK055		0.022	UGG
50.0	20-mar-1990	LM19	UNK055		0.011	UGG

Site: BORE DSB-01-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.0	03-mar-1990	JD19	AS		3.330	UGG
5.0	03-mar-1990	JD19	AS		6.120	UGG
13.0	03-mar-1990	JD19	AS		16.000	UGG

Site: BORE DSB-02-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
1.0	04-mar-1990	JD19	AS		2.010	UGG
5.0	04-mar-1990	JD19	AS		2.320	UGG
35.0	04-mar-1990	JD19	AS		3.150	UGG
40.0	04-mar-1990	JD19	AS		10.400	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE DSB-04-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
1.0	05-mar-1990	JD19	AS		7.530	UGG
5.0	05-mar-1990	JD19	AS		2.620	UGG
20.0	05-mar-1990	JD19	AS		5.050	UGG

Site: BORE TNT-07-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
35.0	03-apr-1990	JD15	SE		0.385	UGG
5.0	03-apr-1990	JD19	AS		3.550	UGG
10.0	03-apr-1990	JD19	AS		2.940	UGG
15.0	03-apr-1990	JD19	AS		9.690	UGG
20.0	03-apr-1990	JD19	AS		4.700	UGG
25.0	03-apr-1990	JD19	AS		4.880	UGG
30.0	03-apr-1990	JD19	AS		5.350	UGG
35.0	03-apr-1990	JD19	AS		4.080	UGG
40.0	03-apr-1990	JD19	AS		6.370	UGG
45.0	03-apr-1990	JD19	AS		9.570	UGG
50.0	03-apr-1990	JD19	AS		5.940	UGG
55.0	03-apr-1990	JD19	AS		15.000	UGG
40.0	03-apr-1990	JD19	AS		6.180	UGG
35.0	03-apr-1990	LW12	246TNT		2.540	UGG
35.0	03-apr-1990	LW12	24DNT		0.935	UGG
35.0	03-apr-1990	LW12	TETRYL		0.750	UGG

Site: BORE TNT-08-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	03-apr-1990	JD19	AS		5.160	UGG
10.0	03-apr-1990	JD19	AS		3.640	UGG
15.0	03-apr-1990	JD19	AS		2.800	UGG
20.0	03-apr-1990	JD19	AS		7.760	UGG
25.0	03-apr-1990	JD19	AS		2.960	UGG
30.0	03-apr-1990	JD19	AS		2.750	UGG
35.0	03-apr-1990	JD19	AS		3.220	UGG
40.0	03-apr-1990	JD19	AS		4.150	UGG
45.0	03-apr-1990	JD19	AS		3.240	UGG
50.0	03-apr-1990	JD19	AS		4.530	UGG
55.0	03-apr-1990	JD19	AS		14.000	UGG
35.0	03-apr-1990	JD19	AS		3.250	UGG

Site: BORE TNT-08-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	03-apr-1990	JS11	PB		29.500	UGG

Site: BORE TNT-09-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	03-apr-1990	JD19	AS		5.780	UGG
10.0	03-apr-1990	JD19	AS		3.180	UGG
15.0	03-apr-1990	JD19	AS		6.470	UGG
20.0	03-apr-1990	JD19	AS		5.090	UGG
25.0	03-apr-1990	JD19	AS		3.480	UGG
30.0	03-apr-1990	JD19	AS		3.640	UGG
35.0	03-apr-1990	JD19	AS		5.000	UGG
40.0	03-apr-1990	JD19	AS		5.020	UGG
45.0	03-apr-1990	JD19	AS		3.180	UGG
50.0	03-apr-1990	JD19	AS		3.680	UGG
55.0	03-apr-1990	JD19	AS		10.700	UGG
35.0	03-apr-1990	JD19	AS		6.550	UGG
5.0	03-apr-1990	JS11	PB		13.100	UGG
35.0	03-apr-1990	JS11	ZN		64.100	UGG

Site: BORE TNT-10-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	02-apr-1990	JD19	AS		8.860	UGG
10.0	02-apr-1990	JD19	AS		4.060	UGG
15.0	02-apr-1990	JD19	AS		8.320	UGG
20.0	02-apr-1990	JD19	AS		9.170	UGG
25.0	02-apr-1990	JD19	AS		4.360	UGG
30.0	02-apr-1990	JD19	AS		4.370	UGG
35.0	02-apr-1990	JD19	AS		2.670	UGG
40.0	02-apr-1990	JD19	AS		6.490	UGG
45.0	02-apr-1990	JD19	AS		1.610	UGG
50.0	02-apr-1990	JD19	AS		10.700	UGG
35.0	02-apr-1990	JD19	AS		6.550	UGG
5.0	02-apr-1990	JS11	PB		8.280	UGG
15.0	02-apr-1990	JS11	ZN		57.500	UGG
30.0	02-apr-1990	JS11	ZN		67.900	UGG
35.0	02-apr-1990	JS11	ZN		61.500	UGG
45.0	02-apr-1990	JS11	ZN		71.000	UGG

Site: BORE TNT-10-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
35.0	02-apr-1990	LM19	MEC6H5		0.001	UGG
15.0	02-apr-1990	LM19	UNK071		0.021	UGG

Site: BORE TNT-11-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	02-apr-1990	JD19	AS		2.900	UGG
10.0	02-apr-1990	JD19	AS		3.750	UGG
15.0	02-apr-1990	JD19	AS		16.000	UGG
20.0	02-apr-1990	JD19	AS		5.620	UGG
25.0	02-apr-1990	JD19	AS		1.820	UGG
30.0	02-apr-1990	JD19	AS		2.080	UGG
35.0	02-apr-1990	JD19	AS		4.120	UGG
40.0	02-apr-1990	JD19	AS		3.580	UGG
45.0	02-apr-1990	JD19	AS		3.140	UGG
50.0	02-apr-1990	JD19	AS		8.120	UGG
35.0	02-apr-1990	JD19	AS		3.530	UGG
15.0	02-apr-1990	JS11	ZN		80.300	UGG
35.0	02-apr-1990	LM19	UNK112		0.008	UGG

Site: BORE TNT-12-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
40.0	04-apr-1990	JD19	AS		2.820	UGG
35.0	04-apr-1990	JS11	ZN		65.600	UGG
40.0	04-apr-1990	LM19	TRCLE		0.003	UGG
5.0	04-apr-1990	LW12	135TNB		18.000	UGG
10.0	04-apr-1990	LW12	135TNB		38.000	UGG
15.0	04-apr-1990	LW12	135TNB		49.000	UGG
20.0	04-apr-1990	LW12	135TNB		14.900	UGG
25.0	04-apr-1990	LW12	135TNB		11.700	UGG
30.0	04-apr-1990	LW12	135TNB		7.780	UGG
35.0	04-apr-1990	LW12	135TNB		7.980	UGG
40.0	04-apr-1990	LW12	135TNB		1.320	UGG
45.0	04-apr-1990	LW12	135TNB		1.300	UGG
50.0	04-apr-1990	LW12	135TNB		2.350	UGG
40.0	04-apr-1990	LW12	135TNB		0.837	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE TNT-12-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	04-apr-1990	LW12	246TNT		26.000	UGG
10.0	04-apr-1990	LW12	246TNT		4.010	UGG
15.0	04-apr-1990	LW12	246TNT		14.500	UGG
20.0	04-apr-1990	LW12	246TNT		9.480	UGG
25.0	04-apr-1990	LW12	246TNT		3.730	UGG
30.0	04-apr-1990	LW12	246TNT		4.620	UGG
35.0	04-apr-1990	LW12	246TNT		0.494	UGG
10.0	04-apr-1990	LW12	24DNT		0.959	UGG
15.0	04-apr-1990	LW12	24DNT		1.940	UGG
20.0	04-apr-1990	LW12	24DNT		0.995	UGG
25.0	04-apr-1990	LW12	24DNT		0.769	UGG
30.0	04-apr-1990	LW12	24DNT		0.739	UGG
5.0	04-apr-1990	LW12	HMX		4.980	UGG
10.0	04-apr-1990	LW12	HMX		14.900	UGG
15.0	04-apr-1990	LW12	HMX		3.860	UGG
20.0	04-apr-1990	LW12	HMX		1.410	UGG
25.0	04-apr-1990	LW12	HMX		3.120	UGG
30.0	04-apr-1990	LW12	HMX		2.280	UGG
35.0	04-apr-1990	LW12	HMX		2.320	UGG
5.0	04-apr-1990	LW12	RDX		59.000	UGG
10.0	04-apr-1990	LW12	RDX		16.200	UGG
15.0	04-apr-1990	LW12	RDX		4.720	UGG
20.0	04-apr-1990	LW12	RDX		2.720	UGG
25.0	04-apr-1990	LW12	RDX		9.560	UGG
30.0	04-apr-1990	LW12	RDX		4.350	UGG
35.0	04-apr-1990	LW12	RDX		12.000	UGG
40.0	04-apr-1990	LW12	RDX		1.980	UGG
45.0	04-apr-1990	LW12	RDX		1.340	UGG
50.0	04-apr-1990	LW12	RDX		1.770	UGG
40.0	04-apr-1990	LW12	RDX		1.260	UGG

Site: BORE TNT-13-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
40.0	05-apr-1990	JD19	AS		3.040	UGG
5.0	05-apr-1990	LM19	TRCLE		0.028	UGG
5.0	05-apr-1990	LW12	35TNB		29.000	UGG
10.0	05-apr-1990	LW12	135TNB		25.000	UGG
15.0	05-apr-1990	LW12	135TNB		30.000	UGG
20.0	05-apr-1990	LW12	135TNB		22.000	UGG
25.0	05-apr-1990	LW12	135TNB		35.000	UGG
30.0	05-arr-1990	LW12	135TNB		6.930	UGG
35.0	05-apr-1990	LW12	135TNB		3.810	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE TNT-13-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
40.0	05-apr-1990	LW12	135TNB		10.200	UGG
45.0	05-apr-1990	LW12	135TNB		3.320	UGG
50.0	05-apr-1990	LW12	135TNB		6.620	UGG
40.0	05-apr-1990	LW12	135TNB		11.200	UGG
10.0	05-apr-1990	LW12	246TNT		1.230	UGG
15.0	05-apr-1990	LW12	246TNT		2.260	UGG
20.0	05-apr-1990	LW12	246TNT		5.260	UGG
25.0	05-apr-1990	LW12	246TNT		11.400	UGG
30.0	05-apr-1990	LW12	246TNT		3.690	UGG
35.0	05-apr-1990	LW12	246TNT		1.120	UGG
40.0	05-apr-1990	LW12	246TNT		1.720	UGG
40.0	05-apr-1990	LW12	246TNT		1.120	UGG
15.0	05-apr-1990	LW12	24DNT		1.640	UGG
20.0	05-apr-1990	LW12	24DNT		0.895	UGG
25.0	05-apr-1990	LW12	24DNT		3.990	UGG
40.0	05-apr-1990	LW12	24DNT		0.496	UGG
40.0	05-apr-1990	LW12	24DNT		0.608	UGG
5.0	05-apr-1990	LW12	HMX		4.730	UGG
10.0	05-apr-1990	LW12	HMX		5.330	UGG
15.0	05-apr-1990	LW12	HMX		5.250	UGG
20.0	05-apr-1990	LW12	HMX		3.950	UGG
25.0	05-apr-1990	LW12	HMX		17.900	UGG
30.0	05-apr-1990	LW12	HMX		1.270	UGG
35.0	05-apr-1990	LW12	HMX		0.817	UGG
40.0	05-apr-1990	LW12	HMX		0.921	UGG
40.0	05-apr-1990	LW12	HMX		0.921	UGG
5.0	05-apr-1990	LW12	RDX		2.100	UGG
10.0	05-apr-1990	LW12	RDX		2.650	UGG
15.0	05-apr-1990	LW12	RDX		3.670	UGG
20.0	05-apr-1990	LW12	RDX		4.980	UGG
25.0	05-apr-1990	LW12	RDX		13.300	UGG
30.0	05-apr-1990	LW12	RDX		2.800	UGG
35.0	05-apr-1990	LW12	RDX		6.520	UGG
40.0	05-apr-1990	LW12	RDX		8.440	UGG
45.0	05-apr-1990	LW12	RDX		2.890	UGG
50.0	05-apr-1990	LW12	RDX		1.870	UGG
40.0	05-apr-1990	LW12	RDX		8.710	UGG

Site: BORE TNT-14-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	09-apr-1990	LW12	135TNB		22.200	UGG
10.0	09-apr-1990	LW12	135TNB		16.600	UGG
15.0	09-apr-1990	LW12	135TNB		3.770	UGG
20.0	09-apr-1990	LW12	135TNB		7.170	UGG
25.0	09-apr-1990	LW12	135TNB		5.900	UGG
30.0	09-apr-1990	LW12	135TNB		5.260	UGG
35.0	09-apr-1990	LW12	135TNB		9.280	UGG
45.0	09-apr-1990	LW12	135TNB		9.970	UGG
50.0	09-apr-1990	LW12	135TNB		10.400	UGG
40.0	09-apr-1990	LW12	135TNB		3.730	UGG
20.0	09-apr-1990	LW12	246TNT		3.420	UGG
25.0	09-apr-1990	LW12	246TNT		1.190	UGG
30.0	09-apr-1990	LW12	246TNT		1.150	UGG
50.0	09-apr-1990	LW12	246TNT		1.130	UGG
5.0	09-apr-1990	LW12	24DNT		1.160	UGG
20.0	09-apr-1990	LW12	24DNT		1.120	UGG
50.0	09-apr-1990	LW12	24DNT		0.557	UGG
5.0	09-apr-1990	LW12	HMX		5.190	UGG
10.0	09-apr-1990	LW12	HMX		5.280	UGG
20.0	09-apr-1990	LW12	HMX		1.870	UGG
25.0	09-apr-1990	LW12	HMX		1.040	UGG
35.0	09-apr-1990	LW12	HMX		0.713	UGG
10.0	09-apr-1990	LW12	RDX		0.790	UGG
15.0	09-apr-1990	LW12	RDX		1.140	UGG
20.0	09-apr-1990	LW12	RDX		2.460	UGG
25.0	09-apr-1990	LW12	RDX		3.840	UGG
30.0	09-apr-1990	LW12	RDX		1.360	UGG
35.0	09-apr-1990	LW12	RDX		6.630	UGG
40.0	09-apr-1990	LW12	RDX		1.400	UGG
45.0	09-apr-1990	LW12	RDX		3.550	UGG
50.0	09-apr-1990	LW12	RDX		5.700	UGG
40.0	09-apr-1990	LW12	RDX		3.420	UGG

Site: BORE TNT-15-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	05-apr-1990	JD19	AS		4.510	UGG
10.0	05-apr-1990	JD19	AS		3.090	UGG
15.0	05-apr-1990	JD19	AS		13.000	UGG
20.0	05-apr-1990	JD19	AS		1.230	UGG
25.0	05-apr-1990	JD19	AS		2.910	UGG
30.0	05-apr-1990	JD19	AS		9.570	UGG
35.0	05-apr-1990	JD19	AS		4.220	UGG
40.0	05-apr-1990	JD19	AS		5.300	UGG
45.0	05-apr-1990	JD19	AS		2.440	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE TNT-15-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.0	05-apr-1990	JD19	AS		3.060	UGG
40.0	05-apr-1990	JD19	AS		4.470	UGG
5.0	05-apr-1990	LW12	135TNB		28.000	UGG
10.0	05-apr-1990	LW12	135TNB		20.600	UGG
15.0	05-apr-1990	LW12	135TNB		19.200	UGG
20.0	05-apr-1990	LW12	135TNB		7.990	UGG
25.0	05-apr-1990	LW12	135TNB		15.700	UGG
30.0	05-apr-1990	LW12	135TNB		6.230	UGG
35.0	05-apr-1990	LW12	135TNB		7.270	UGG
40.0	05-apr-1990	LW12	135TNB		14.700	UGG
45.0	05-apr-1990	LW12	135TNB		9.270	UGG
50.0	05-apr-1990	LW12	135TNB		1.380	UGG
40.0	05-apr-1990	LW12	135TNB		14.400	UGG
5.0	05-apr-1990	LW12	246TNT		1.020	UGG
10.0	05-apr-1990	LW12	246TNT		0.817	UGG
15.0	05-apr-1990	LW12	246TNT		7.540	UGG
20.0	05-apr-1990	LW12	246TNT		0.589	UGG
25.0	05-apr-1990	LW12	246TNT		4.650	UGG
30.0	05-apr-1990	LW12	246TNT		2.140	UGG
40.0	05-apr-1990	LW12	246TNT		0.621	UGG
45.0	05-apr-1990	LW12	246TNT		0.901	UGG
40.0	05-apr-1990	LW12	246TNT		0.658	UGG
5.0	05-apr-1990	LW12	24DNT		0.627	UGG
15.0	05-apr-1990	LW12	24DNT		1.420	UGG
25.0	05-apr-1990	LW12	24DNT		1.250	UGG
45.0	05-apr-1990	LW12	24DNT		0.548	UGG
5.0	05-apr-1990	LW12	HMX		4.730	UGG
10.0	05-apr-1990	LW12	HMX		3.300	UGG
15.0	05-apr-1990	LW12	HMX		3.990	UGG
20.0	05-apr-1990	LW12	HMX		0.814	UGG
25.0	05-apr-1990	LW12	HMX		5.600	UGG
30.0	05-apr-1990	LW12	HMX		0.870	UGG
40.0	05-apr-1990	LW12	HMX		0.852	UGG
45.0	05-apr-1990	LW12	HMX		0.690	UGG
40.0	05-apr-1990	LW12	HMX		0.939	UGG
5.0	05-apr-1990	LW12	RDX		5.840	UGG
10.0	05-apr-1990	LW12	RDX		1.450	UGG
15.0	05-apr-1990	LW12	RDX		6.460	UGG
20.0	05-apr-1990	LW12	RDX		3.060	UGG
25.0	05-apr-1990	LW12	RDX		15.800	UGG
30.0	05-apr-1990	LW12	RDX		2.940	UGG
35.0	05-apr-1990	LW12	RDX		3.150	UGG
40.0	05-apr-1990	LW12	RDX		5.060	UGG
45.0	05-apr-1990	LW12	RDX		5.960	UGG
50.0	05-apr-1990	LW12	RDX		3.320	UGG
40.0	05-apr-1990	LW12	RDX		6.640	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE TNT-16-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	10-apr-1990	JD19	AS		5.700	UGG
10.0	10-apr-1990	JD19	AS		3.520	UGG
15.0	10-apr-1990	JD19	AS		15.000	UGG
20.0	10-apr-1990	JD19	AS		1.680	UGG
25.0	10-apr-1990	JD19	AS		7.940	UGG
30.0	10-apr-1990	JD19	AS		7.710	UGG
35.0	10-apr-1990	JD19	AS		4.210	UGG
40.0	10-apr-1990	JD19	AS		4.430	UGG
45.0	10-apr-1990	JD19	AS		2.380	UGG
50.0	10-apr-1990	JD19	AS		3.080	UGG
45.0	10-apr-1990	JS11	ZN		57.600	UGG
5.0	10-apr-1990	LW12	135TNB		19.300	UGG
10.0	10-apr-1990	LW12	135TNB		33.000	UGG
15.0	10-apr-1990	LW12	135TNB		42.000	UGG
20.0	10-apr-1990	LW12	135TNB		12.400	UGG
25.0	10-apr-1990	LW12	135TNB		7.260	UGG
30.0	10-apr-1990	LW12	135TNB		4.870	UGG
35.0	10-apr-1990	LW12	135TNB		10.100	UGG
40.0	10-apr-1990	LW12	135TNB		8.540	UGG
25.0	10-apr-1990	LW12	135TNB		7.060	UGG
5.0	10-apr-1990	LW12	246TNT		16.700	UGG
10.0	10-apr-1990	LW12	246TNT		2.060	UGG
20.0	10-apr-1990	LW12	246TNT		2.720	UGG
20.0	10-apr-1990	LW12	24DNT		1.640	UGG
20.0	10-apr-1990	LW12	RDX		0.929	UGG
25.0	10-apr-1990	LW12	RDX		0.711	UGG
30.0	10-apr-1990	LW12	RDX		0.686	UGG
35.0	10-apr-1990	LW12	RDX		0.892	UGG
40.0	10-apr-1990	LW12	RDX		1.740	UGG
45.0	10-apr-1990	LW12	RDX		2.080	UGG
50.0	10-apr-1990	LW12	RDX		1.720	UGG

Site: BORE TNT-17-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	09-apr-1990	JD19	AS		3.580	UGG
10.0	09-apr-1990	JD19	AS		3.250	UGG
15.0	09-apr-1990	JD19	AS		5.180	UGG
20.0	09-apr-1990	JD19	AS		1.680	UGG
25.0	09-apr-1990	JD19	AS		4.360	UGG
30.0	09-apr-1990	JD19	AS		13.000	UGG
35.0	09-apr-1990	JD19	AS		4.470	UGG
40.0	09-apr-1990	JD19	AS		3.700	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: BORE TNT-17-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
45.0	09-apr-1990	JD19	AS		6.090	UGG
50.0	09-apr-1990	JD19	AS		2.500	UGG
40.0	09-apr-1990	JS11	ZN		66.100	UGG
5.0	09-apr-1990	LW12	135TNB		16.900	UGG
10.0	09-apr-1990	LW12	135TNB		21.500	UGG
15.0	09-apr-1990	LW12	135TNB		14.800	UGG
20.0	09-apr-1990	LW12	135TNB		6.600	UGG
25.0	09-apr-1990	LW12	135TNB		11.200	UGG
30.0	09-apr-1990	LW12	135TNB		4.960	UGG
35.0	09-apr-1990	LW12	135TNB		12.200	UGG
40.0	09-apr-1990	LW12	135TNB		17.400	UGG
45.0	09-apr-1990	LW12	135TNB		2.150	UGG
50.0	09-apr-1990	LW12	135TNB		12.900	UGG
25.0	09-apr-1990	LW12	135TNB		8.610	UGG
5.0	09-apr-1990	LW12	246TNT		2.650	UGG
15.0	09-apr-1990	LW12	246TNT		1.910	UGG
40.0	09-apr-1990	LW12	RDX		1.510	UGG
50.0	09-apr-1990	LW12	RDX		1.900	UGG

Site: BORE TNT-18-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	09-apr-1990	JD19	AS		3.420	UGG
10.0	09-apr-1990	JD19	AS		4.810	UGG
15.0	09-apr-1990	JD19	AS		3.840	UGG
20.0	09-apr-1990	JD19	AS		2.460	UGG
25.0	09-apr-1990	JD19	AS		8.510	UGG
30.0	09-apr-1990	JD19	AS		10.800	UGG
35.0	09-apr-1990	JD19	AS		4.240	UGG
40.0	09-apr-1990	JD19	AS		2.080	UGG
45.0	09-apr-1990	JD19	AS		3.280	UGG
50.0	09-apr-1990	JD19	AS		3.960	UGG
25.0	09-apr-1990	LW12	135TNB		7.350	UGG
5.0	09-apr-1990	LW12	135TNB		22.100	UGG
10.0	09-apr-1990	LW12	135TNB		21.000	UGG
15.0	09-apr-1990	LW12	135TNB		27.000	UGG
20.0	09-apr-1990	LW12	135TNB		4.350	UGG
25.0	09-apr-1990	LW12	135TNB		7.460	UGG
30.0	09-apr-1990	LW12	135TNB		5.730	UGG
35.0	09-apr-1990	LW12	135TNB		11.000	UGG
40.0	09-apr-1990	LW12	135TNB		6.830	UGG
45.0	09-apr-1990	LW12	135TNB		1.950	UGG

Site: BORE TNT-18-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.0	09-apr-1990	LW12	135TNB		0.715	UGG
25.0	09-apr-1990	LW12	246TNT		0.477	UGG
5.0	09-apr-1990	LW12	246TNT		1.870	UGG
10.0	09-apr-1990	LW12	246TNT		0.955	UGG
15.0	09-apr-1990	LW12	246TNT		8.710	UGG
25.0	09-apr-1990	LW12	246TNT		0.722	UGG
25.0	09-apr-1990	LW12	24DNT		0.461	UGG
15.0	09-apr-1990	LW12	24DNT		1.440	UGG
25.0	09-apr-1990	LW12	24DNT		0.723	UGG
15.0	09-apr-1990	LW12	RDX		0.875	UGG
35.0	09-apr-1990	LW12	RDX		1.100	UGG
40.0	09-apr-1990	LW12	RDX		0.650	UGG
45.0	09-apr-1990	LW12	RDX		0.645	UGG

Site: BORE TNT-19-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	10-apr-1990	JD19	AS		4.220	UGG
10.0	10-apr-1990	JD19	AS		3.630	UGG
15.0	10-apr-1990	JD19	AS		8.340	UGG
20.0	10-apr-1990	JD19	AS		2.830	UGG
25.0	10-apr-1990	JD19	AS		6.710	UGG
30.0	10-apr-1990	JD19	AS		29.000	UGG
35.0	10-apr-1990	JD19	AS		4.240	UGG
40.0	10-apr-1990	JD19	AS		1.180	UGG
45.0	10-apr-1990	JD19	AS		4.520	UGG
50.0	10-apr-1990	JD19	AS		2.580	UGG
25.0	10-apr-1990	LW12	135TNB		4.080	UGG
5.0	10-apr-1990	LW12	135TNB		16.400	UGG
10.0	10-apr-1990	LW12	135TNB		26.000	UGG
15.0	10-apr-1990	LW12	135TNB		9.830	UGG
20.0	10-apr-1990	LW12	135TNB		4.480	UGG
25.0	10-apr-1990	LW12	135TNB		5.160	UGG
30.0	10-apr-1990	LW12	135TNB		2.720	UGG
35.0	10-apr-1990	LW12	135TNB		10.500	UGG
40.0	10-apr-1990	LW12	135TNB		11.400	UGG
5.0	10-apr-1990	LW12	246TNT		7.360	UGG
15.0	10-apr-1990	LW12	24DNT		1.000	UGG
35.0	10-apr-1990	LW12	24DNT		0.465	UGG
40.0	10-apr-1990	LW12	24DNT		0.469	UGG
35.0	10-apr-1990	LW12	RDX		1.260	UGG
40.0	10-apr-1990	LW12	RDX		1.190	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: COMP TNT-01-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT		25.000	DEGC
0.5	04-apr-1990	JD19	AS		3.640	UGG
0.5	04-apr-1990	LW12	135TNB		110.000	UGG
0.5	04-apr-1990	LW12	246TNT		12000.000	UGG
0.5	04-apr-1990	LW12	HMX		7.000	UGG
0.5	04-apr-1990	LW12	RDX		310.000	UGG

Site: COMP TNT-02-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT		85.000	DEGC
0.5	04-apr-1990	JD19	AS		4.570	UGG
0.5	04-apr-1990	LW12	135TNB		120.000	UGG
0.5	04-apr-1990	LW12	246TNT		4600.000	UGG
0.5	04-apr-1990	LW12	24DNT		19.000	UGG
0.5	04-apr-1990	LW12	HMX		23.000	UGG
0.5	04-apr-1990	LW12	RDX		1300.000	UGG

Site: COMP TNT-03-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT		90.000	DEGC
0.5	04-apr-1990	JD19	AS		5.870	UGG
0.5	04-apr-1990	LW12	135TNB		48.000	UGG
0.5	04-apr-1990	LW12	246TNT		2200.000	UGG
0.5	04-apr-1990	LW12	24DNT		8.200	UGG
0.5	04-apr-1990	LW12	HMX		10.000	UGG
0.5	04-apr-1990	LW12	RDX		370.000	UGG

Site: COMP TNT-04-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT		90.000	DEGC
0.5	04-apr-1990	JD19	AS		5.040	UGG
0.5	04-apr-1990	LW12	135TNB		94.000	UGG
0.5	04-apr-1990	LW12	246TNT		8300.000	UGG
0.5	04-apr-1990	LW12	RDX		110.000	UGG

Site: COMP TNT-05-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT		50.000	DEGC
0.5	04-apr-1990	00	IGNIT	GT	100.000	DEGC
0.5	04-apr-1990	JD19	AS		5.990	UGG
0.5	04-apr-1990	JD19	AS		4.180	UGG
0.5	04-apr-1990	LW12	135TNB		41.000	UGG
0.5	04-apr-1990	LW12	135TNB		43.000	UGG
0.5	04-apr-1990	LW12	246TNT		6500.000	UGG
0.5	04-apr-1990	LW12	246TNT		9900.000	UGG
0.5	04-apr-1990	LW12	RDX		2.720	UGG

Site: COMP TNT-06-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT	GT	100.000	DEGC
0.5	04-apr-1990	JD19	AS		3.440	UGG
0.5	04-apr-1990	LW12	135TNB		22.000	UGG
0.5	04-apr-1990	LW12	246TNT		5900.000	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 09/07/90
(Booleans LT and ND are excluded)

Site: COMP TNT-07-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT		72.000	DEGC
0.5	04-apr-1990	JD19	AS		3.210	UGG
0.5	04-apr-1990	LW12	135TNB		11.000	UGG
0.5	04-apr-1990	LW12	246TNT		290.000	UGG

Site: COMP TNT-08-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT	GT	100.000	DEGC
0.5	04-apr-1990	JD19	AS		3.030	UGG
0.5	04-apr-1990	LW12	135TNB		1.420	UGG
0.5	04-apr-1990	LW12	246TNT		7.780	UGG

Program ended normally.$

ROUND 2 GROUNDWATER SAMPLE RESULTS
ABANDONED LANDFILL

FIELD ID	ALF-01-MWA	ALF-02-MWA	ALF-03-MWA	ALF-GW-RB	ALF-01-MWADUP
LAB ID	SIADW2*6	SIADW2*7	SIADW2*8	SIADW2*9	SIADW2*10
COLLECTION DATE	5/31/90	6/1/90	6/1/90	6/1/90	5/31/90
COLLECTION TIME	17:15	8:45	10:45	9:35	17:25
DEPTH (FEET)	90.4	85.5	83.3	0	90.4
PARAMETER NAME	ug/L	ug/L	ug/L	ug/L	ug/L
FIELD PARAMETERS					
pH (Std. Units)	7	6.6	7.1		7
SPECIFIC CONDUCTIVITY @ 25C (umHos/cm)	1000	1000	1200		1000
WATER TEMPERATURE (deg.C)					
INORGANICS					
ARSENIC	<2.54	6.72	4.16	<2.54	3.41
BARIUM	19.9	16.1	52.3	<5.00	20.2
LEAD	2.6	2.2	3.4	2.1	2.9
SELENIUM	18.7	6.8	16.6	<3.0	18.4
CALCIUM (ug/L-CA)	119000	134000	174000	797	116000
SODIUM (ug/L-NA)	50900	122000	56500	811	53000
RESIDUE	900	1100	1250	20	884
CHLORIDE	103000	65500	272000	<2.30	101000
SULFATE	322000	438000	251000	<10000	311000
VOLATILE ORGANIC COMPOUNDS					
CHLOROFORM	<0.50	<0.50	0.99	0.65	<0.50
1,2-DICHLOROETHENE	<0.50	0.62	<0.50	<0.50	<0.50
TRICHLOROETHENE	<0.50	70.2	<0.50	<0.50	<0.50
EXTRACTABLE ORGANIC COMPOUNDS					
BIS(2-ETHYLHEXYL)PHTHALATE	<4.8	<4.8	6.1	<4.8	<4.8
CYANIDE	<2.5	3.31	<2.5	<2.5	<2.5

ROUND 2 GROUNDWATER SAMPLE RESULTS
CHEMICAL BURIAL SITE/CONSTRUCTION DEBRIS LANDFILL

FIELD ID	CCB-01-MWA	CCB 02-MWA	CCB GW RB
LAB ID	SIADW2*11	SIADW2*12	SIADW2*13
COLLECTION DATE	6/1/90	6/2/90	6/2/90
COLLECTION TIME	15:10	9:50	8:45
DEPTH (FEET)	77.1	85.3	0
PARAMETER NAME	ug/L	ug/L	ug/L
FIELD PARAMETERS			
pH (Std. Units)	6.9	6.7	
SPECIFIC CONDUCTIVITY @ 25 C (umHos/cm)	600	1000	
WATER TEMPERATURE (deg. C)			
INORGANICS			
ARSENIC	8.64	7.14	<25.4
BARIUM	53.9	31.2	10.3
COPPER	25.1	8.27	<8.09
LEAD	2.5	2.9	<1.3
SELENIUM	3.3	10.6	<3.0
ZINC	<21.1	<21.1	24
CALCIUM (ug/L-CA)	72400	113000	1380
SODIUM (ug/L-NA)	37300	51500	683
RESIDUE	564	808	12
CHLORIDE	32100	96800	<2130
SULFATE	111000	238000	<10000
VOLATILE ORGANIC COMPOUNDS			
CHLOROFORM	<0.50	<0.50	2.0
TRICHLOROETHENE	<0.50	4.67	<0.50

ROUND 2 GROUNDWATER SAMPLE RESULTS
DRMO TRENCH SITE

FIELD ID	DMO-03-MWA	DMO-04-MWA	DMO-05-MWA	DMO GW-RB	DMO-03-MWADUP
LAB ID	SIADW2*1	SIADW2*2	SIADW2*3	SIADW2*4	SIADW2*5
COLLECTION DATE	5/31/90	5/31/90	5/31/90	5/31/90	5/31/90
COLLECTION TIME	10:20	14:05	15:30	13:45	10:25
DEPTH (FEET)	94.8	95	94.1	0	94.8
PARAMETER NAME	ug/L	ug/L	ug/L	ug/L	ug/L
FIELD PARAMETERS					
pH (Std. Units)	6.8	6.8	6.9		6.8
SPECIFIC CONDUCTIVITY @ 25C (umHos/cm)	1200	1100	100		1200
WATER TEMPERATURE (deg. C)					
INORGANICS					
ARSENIC	2.77	4.26	4.48	<2.54	<2.54
BARIUM	36.4	18.7	23	<5.00	34.3
LEAD	2	2.3	<1.3	1.7	4.3
SELENIUM	13.2	6.2	11.4	<3.0	12.6
CALCIUM (ug/L-CA)	127000	85200	96700	1900	126000
SODIUM (ug/L-NA)	69000	67000	75700	1640	77600
RESIDUE	1070	776	916	10	1090
CHLORIDE	51900	50500	58500	<2130	52500
SULFATE	377000	223000	277000	<10000	383000
VOLATILE ORGANIC COMPOUNDS					
CHLOROFORM	<0.50	<0.50	<0.50	2.2	<0.50
METHYLENE CHLORIDE	7.5	<0.23	<0.23	<0.23	6.6
TRICHLOROETHENE	2.56	2.16	18.5	<0.50	2.58

ROUND 2 GROUNDWATER SAMPLE RESULTS
BASE PRODUCTION WELLS

FIELD ID	PSW-02	PSW-08	PSW-09	PSW-02DUP
LAB ID	SIADW2*14	SIADW2*16	SIADW2*17	SIADW2*18
COLLECTION DATE	6/7/90	6/7/90	6/7/90	6/7/90
COLLECTION TIME	9:00	9:25	9:35	9:10
DEPTH (FEET)	120	120	120	120
PARAMETER NAME	ug/L	ug/L	ug/L	ug/L
FIELD PARAMETERS				
pH (Std. Units)				
SPECIFIC CONDUCTIVITY @ 25 C (umHos/cm)				
WATER TEMPERATURE (deg. C)				
INORGANICS				
ARSENIC	3.94	4.8	4.37	3.41
BARIUM	39.1	37.7	60.6	25.4
COPPER	8.26	<8.09	<8.09	<8.09
LEAD	3.5	3.9	2	3.3
SELENIUM	<3.0	<3.0	<3.0	4.4
ZINC	<21.1	50.3	<21.1	51.5
CALCIUM (ug/L-C..)	109000	96200	30000	117000
SODIUM (ug/L-NA)	72800	78400	50900	71400
RESIDUE,DISS	732	666	318	754
CHLORIDE	68100	44400	16900	67500
SULFATE	293000	289000	50000	294000
EXTRACTABLE ORGANIC COMPOUNDS				
CYANIDE	<2.50	<2.50	11.2	11.3

ROUND 2 GROUNDWATER SAMPLE RESULTS
BACKGROUND WELL

FIELD ID	DSB-04-MWA
LAB ID	SIADW2*22
COLLECTION DATE	6/8/90
COLLECTION TIME	11:25
DEPTH (FEET)	22.9
PARAMETER NAME	ug/L
FIELD PARAMETERS	
pH (Std. Units)	6
SPECIFIC CONDUCTIVITY @ 25 C (umHos/cm)	
WATER TEMPERATURE (deg. C)	
INORGANICS	
ARSENIC	170
BARIUM	18.8
SELENIUM	7.7
SILVER	0.4
CALCIUM (ug/L-CA)	218000
SODIUM (ug/L-NA)	2300000

ROUND 2 GROUNDWATER SAMPLE RESULTS
TNT LEACHING BEDS

FIELD ID	TNT-01-MWA	TNT-01-MWADUP	TNT-01-MWB	TNT-01-MWC	TNT-02-MWA	TNT-02-MWB	TNT-02-MWC	TNT-03-MWA
LAB ID	SIADW2*27	SIADW2*52	SIADW2*28	SIADW2*29	SIADW2*30	SIADW2*31	SIADW2*32	SIADW2*33
COLLECTION DATE	6/8/90	6/8/90	6/5/90	6/5/90	6/4/90	6/4/90	6/4/90	6/8/90
COLLECTION TIME	9:40	9:50	11:25	9:45	17:30	11:50	10:20	12:40
DEPTH (FEET)	55.4	55.4	56	55.9	54.3	54.6	54	52.7
PARAMETER NAME	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
FIELD PARAMETERS								
pH (Std. Units)	6.8	6.8	6.5	6.6	6.3	7.6	7.6	6.9
SPECIFIC CONDUCTIVITY @ 25 C (umHos/cm)	900	900	1000	1000	1300	900	920	1000
WATER TEMPERATURE (deg. C)								
INORGANICS								
ARSENIC	15	12.9	5.44	6.18	7.36	14	5.12	7.89
BARIUM	26	23	21.8	30.6	38.8	18.7	8.8	34
CHROMIUM	<6.02	<6.02	<6.02	<6.02	6.07	<6.02	9.06	<6.02
LEAD	7.5	10.2	1.6	3.4	5.4	3.3	2.9	<1.3
MERCURY	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
SELENIUM	<3.0	<3.0	<3.0	<3.0	3.9	<3.0	<3.0	<3.0
ZINC	<21.1	<21.1	135	209	23.8	90.1	<21.1	<21.1
CALCIUM (ug/L-CA)	14800	15300	81200	84500	56900	61100	8420	26600
SODIUM (ug/L-NA)	189000	209000	187000	133000	274000	211000	167000	217000
RESIDUE	840	830	946	766	1280	900	726	808
CHLORIDE	40100	40000	132000	80600	170000	140000	79500	46300
SULFATE	188000	185000	266000	216000	258000	257000	233000	102000
VOLATILE ORGANICE COMPOUNDS								
CARBON TETRACHLORIDE	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250
BENZENE	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
CARBON TETRACHLORIDE	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250
CHLOROBENZENE	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
CHLOROFORM	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	<0.50	<0.50
1,2-DICHLOROETHANE	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
METHYLENE CHLORIDE	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23
TOLUENE	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
TRICHLOROETHENE	29.7	30.7	<0.50	1.98	2.53	<0.50	<0.50	<0.50
EXTRACTABLE ORGANIC COMPOUNDS								
BIS(2-ETHYLHEXYL)PHTHALATE	<4.8	<4.8	<4.8	6.5	<4.8	4.5	14	<4.8
2,4-DINITROTOLUENE	53	49	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5
EXPLOSIVES								
2,4-DINITROTOLUENE	46.7	86.9	<0.612	<0.612	5.93	<0.612	<0.612	6.19
RDX	54.8	86.9	<2.11	4.18	217	<2.11	<2.11	34.2
TETRYL	<0.6	<0.6	<0.6	<0.6	<0.6	0.8	0.8	<0.6
1,3,5-TRINITROBENZENE	643	862	<0.626	<0.626	215	1.38	<0.626	13
2,4,6-TRINITROTOLUENE	<0.588	1.22	<0.588	<0.588	8.14	<0.588	<0.588	<0.588

ROUND 2 GROUNDWATER SAMPLE RESULTS
TNT LEACHING BEDS

FIELD ID	TNT-04-MWA	TNT-05-MWA	TNT-06-MWA	TNT-07-MWA	TNT-07-MWB	TNT-07-MWC	TNT-08-MWA	TNT-09 MWA
LAB ID	SIADW2*34	SIADW2*35	SIADW2*36	SIADW2*37	SIADW2*38	SIADW2*39	SIADW2*40	SIADW2*41
COLLECTION DATE	6/8/90	6/7/90	6/6/90	6/6/90	6/6/90	6/6/90	6/7/90	6/6/90
COLLECTION TIME	14:00	9:30	15:25	12:25	10:55	9:55	20:35	17:00
DEPTH (FEET)	53.7	58.5	54.6	56.1	56	56	55.3	55
PARAMETER NAME	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
FIELD PARAMETERS								
pH (Std Units)	6.8	6.7	6.8	7	6.5	6.7	7	7
SPECIFIC CONDUCTIVITY @ 25 C (umHos/cm)	1000	800	1600	1000	1000	1000	1000	960
WATER TEMPERATURE (deg. C)								
INORGANICS								
ARSENIC	5.65	17	5.65	9.81	7.89	5.65	10.1	4.9
BARIUM	35.4	40.2	52.5	17.6	15.5	28	46	56.3
CHROMIUM	<6.02	<6.02	<6.02	9.5	7.81	<6.02	<6.02	<6.02
LEAD	<1.3	<1.3	7	6.6	9	8.8	2.2	10.7
MERCURY	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
SELENIUM	3.6	3.5	6.8	<3.0	<3.0	<3.0	<3.0	<3.0
ZINC	<21.1	25	23.3	<21.1	<21.1	47.3	26	<21.1
CALCIUM (ug/L-CA)	45800	46800	70000	18500	30600	75800	18900	75400
SODIUM (ug/L-NA)	216000	167000	369000	245000	225000	152000	199000	137000
RESIDUE	940	716	1530	802	814	760	778	736
CHLORIDE	180000	66200	233000	95300	110000	100000	51700	43600
SULFATE	243000	138000	403000	176000	203000	211000	239000	278000
VOLATILE ORGANIC COMPOUNDS								
CARBON TETRACHLORIDE	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250
BENZENE	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
CARBON TETRACHLORIDE	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250
CHLOROBENZENE	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
CHLOROFORM	<0.50	<0.50	<0.50	0.52	<0.50	<0.50	<0.50	<0.50
1,2-DICHLOROETHANE	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
METHYLENE CHLORIDE	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23
TOLUENE	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
TRICHLOROETHENE	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
EXTRACTABLE ORGAINC COMPOUNDS								
BIS(2-ETHYLHEXYL)PHTHALATE	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8
2,4 DINITROTOLUENE	<4.5	10.3	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5
EXPLOSIVES								
2,4 DINITROTOLUENE	<0.162	<0.162	0.851	2.56	<0.162	<0.162	<0.162	<0.162
RDX	<2.11	<2.11	<2.11	<2.11	<2.11	<2.11	<2.11	<2.11
TETRYL	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
1,3,5 TRINITROBENZENE	3.37	6.48	2.34	4.98	<0.626	<0.626	0.885	3.81
2,4,6 TRINITROTOLUENE	1.03	<0.588	<0.588	<0.588	<0.588	<0.588	<0.588	<0.588

ROUND 2 GROUNDWATER SAMPLE RESULTS
TNT LEACHING BEDS

FIELD ID	TNT-10-MWA	TNT-10 MWADUP	TNT-10 MWB	TNT-10 MWC	TNT-11 MWA	TNT-12 MWA	TNT-13 MWA	TNT-14-MWA
LAB ID	SIADW2*42	SIADW2*51	SIADW2*43	SIADW2*44	SIADW2*45	SIADW2*46	SIADW2*47	SIADW2*48
COLLECTION DATE	6/3/90	6/3/90	6/3/90	6/3/90	6/7/90	6/7/90	6/7/90	6/3/90
COLLECTION TIME	13:30	13:30	11:45	10:45	17:30	12:45	19:00	18:10
DEPTH (FEET)	56	56	56.8	55.9	59.2	50.3	52.2	49.5
PARAMETER NAME	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
FIELD PARAMETERS								
pH (Std. Units)	7.3	7.3	6	6.6	7	7.1	6.8	6.8
SPECIFIC CONDUCTIVITY @ 25 C (umHos/cm)	1000	1000	1000	920	1800	900	960	1000
WATER TEMPERATURE (deg. C)								
INORGANICS								
ARSENIC	10.2	10.6	12.8	9.38	9.91	17.7	9.38	27.3
BARIUM	49.3	49.8	19	32.1	18	25.1	45.6	46.2
CHROMIUM	213	223	<6.02	<6.02	<6.02	<6.02	<6.02	<6.02
LEAD	3.8	2.3	2.8	2.9	<1.3	<1.3	9.4	3
MERCURY	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	<0.2
SELENIUM	<3.0	<3.0	<3.0	<3.0	8	<3.0	<3.0	52.2
ZINC	<21.1	<21.1	175	<21.1	<21.1	<21.1	<21.1	<21.1
CALCIUM (ug/L-CA)	64300	63800	60700	60500	137000	38700	31600	32000
SODIUM (ug/L-NA)	269000	225000	179000	130000	570000	290000	212000	257000
RESIDUE	1010	932	830	640	2090	1150	918	938
CHLORIDE	77200	76300	102000	58700	176000	80100	61700	71200
SULFATE	179000	177000	231000	202000	696000	396000	228000	137000
VOLATILE ORGANIC COMPOUNDS								
CARBON TETRACHLORIDE	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	0.267	<0.250
BENZENE	<0.50	6.08	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
CARBON TETRACHLORIDE	120	110	<0.250	<0.250	23	<0.250	<0.250	<0.250
CHLOROBENZENE	<0.50	6.75	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
CHLOROFORM	500	480	<0.50	<0.50	40	0.75	0.53	<0.50
1,2-DICHLOROETHANE	74	73	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
METHYLENE CHLORIDE	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23
TOLUENE	<0.50	7.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
TRICHLOROETHENE	<0.50	<0.50	<0.50	<0.50	221	0.82	9.64	<0.50
EXTRACTABLE ORGANIC COMPOUNDS								
BIS(2-ETHYLHEXYL)PHTHALATE	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8
2,4 DINITROTOLUENE	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5
EXPLOSIVES								
2,4 DINITROTOLUENE	<0.612	<0.612	<0.612	<0.612	<0.612	0.769	<0.612	<0.612
RDX	<2.11	<2.11	<2.11	<2.11	<2.11	<2.11	<2.11	<2.11
TETRYL	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
1,3,5 TRINITROBENZENE	<0.626	<0.626	<0.626	<0.626	0.866	1.12	<0.626	13.4
2,4,6 TRINITROTOLUENE	<0.588	<0.588	<0.588	<0.588	<0.588	<0.588	<0.588	<0.588

ROUND 2 GROUNDWATER SAMPLE RESULTS
TNT LEACHING BEDS

FIELD ID	TNT-15-MWA	TNT-16 MWA	TNT-GW-RB
LAB ID	SIADW2*49	SIADW2*50	SIADW2*53
COLLECTION DATE	6/2/90	6/2/90	6/6/90
COLLECTION TIME	14:45	13:00	10:25
DEPTH (FEET)	52	56.7	0
PARAMETER NAME	ug/L	ug/L	ug/L
FIELD PARAMETERS			
pH (Std. Units)	6.8	7.2	
SPECIFIC CONDUCTIVITY @ 25 C (um	1400	1000	
WATER TEMPERATURE (deg. C)			
INORGANICS			
ARSENIC	7.14	8.74	<2.54
BARIUM	37.8	22.6	<5.00
CHROMIUM	<6.02	<6.02	<6.02
LEAD	3.8	2.3	<1.3
MERCURY	<0.2	<0.2	<0.2
SELENIUM	7.4	<3.0	<3.0
ZINC	<21.1	<21.1	<21.1
CALCIUM (ug/L-CA)	57000	64500	618
SODIUM (ug/L-NA)	275000	102000	695
RESIDUE	1320	696	<5
CHLORIDE	210000	64500	<2130
SULFATE	289000	221000	<10000
VOLATILE ORGANIC COMPOUNDS			
CARBON TETRACHLORIDE	<0.250	<0.250	<0.250
BENZENE	<0.50	<0.50	<0.50
CARBON TETRACHLORIDE	<0.250	<0.250	<0.250
CHLOROBENZENE	<0.50	<0.50	<0.50
CHLOROFORM	<0.50	<0.50	0.63
1,2-DICHLOROETHANE	<0.50	<0.50	<0.50
METHYLENE CHLORIDE	<0.23	<0.23	5.4
TOLUENE	<0.50	<0.50	<0.50
TRICHLOROETHENE	<0.50	<0.50	<0.50
EXTRACTABLE ORGANIC COMPOUNDS			
BIS(2-ETHYLHEXYL)PHTHALATE	<4.8	<4.8	<4.8
2,4 DINITROTOLUENE	<4.5	<4.5	<4.5
EXPLOSIVES			
2,4 DINITROTOLUENE	<0.612	<0.612	<0.612
RDX	6.72	<2.11	<2.11
TETRYL	<0.6	<0.6	<0.6
1,3,5 TRINITROBENZENE	<0.626	<0.626	<0.626
2,4,6 TRINITROTOLUENE	<0.588	<0.588	<0.588

Analytical Method Reporting Limits

JMM James M. Montgomery

Consulting Engineers Inc.

Table 1 (Page 1 of 2)

LM18
EXTRACTABLE ORGANICS IN SOIL BY GC/MS

SHORT NAME	STORET	LONG NAME	CRL	UCR	SLOPE
124TCB	99492	1,2,4-TRICHLOROBENZENE	0.04	13	0.801
12DCLB	99470	1,2-DICHLOROBENZENE	0.11	13	0.734
13DCLB	99472	1,3-DICHLOROBENZENE	0.13	13	0.724
14DCLB	99469	1,4-DICHLOROBENZENE	0.098	13	0.715
24DCLP	99498	2,4-DICHLOROPHENOL	0.18	13	0.909
24DMPN	99499	2,4-DIMETHYLPHENOL	0.69	1.3	0.917
24DNP	99495	2,4-DINITROPHENOL	2.1	6.7	0.816
24DNT	99474	2,4-DINITROTOLUENE	0.14	13	0.936
2CLP	99497	2-CHLOROPHENOL	0.06	13	0.745
2CNAP	99464	2-CHLORONAPHTHALENE	0.036	13	0.847
2NP	99495	2-NITROPHENOL	0.14	13	0.915
33DCBD	99471	3,3-DICHLOROBENZIDINE	6.3	13	0.633
46DN2C	99686	2-METHYL-4,6-DINITROPHENOL	0.55	13	1.060
4BRPPE	99462	4-BROMOPHENYLPHENYL ETHER	0.033	6.7	0.921
4CL3C	99683	3-METHYL-4-CHLOROPHENOL	0.095	13	0.894
4CLPPE	99465	4-CHLOROPHENYLPHENYL ETHER	0.033	13	0.826
4NP	99496	4-NITROPHENOL	1.4	33	0.921
ANAPYL	99451	ACENAPHTHYLENE	0.033	6.7	0.881
ANTRC	99452	ANTHRACENE	0.033	13	0.870
B2CEXM	99459	BIS(2-CHLOROETHOXY) METHANE	0.059	13	0.863
B2CIPE	99461	BIS(2-CHLOROISOPROPYL) ETHER	0.2	13	0.819
B2CLEE	99458	BIS(2-CHLOROETHYL) ETHER	0.033	6.7	0.802
BAANTR	99453	BENZO [A] ANTHRACENE	0.17	13	1.06
BAPYR	99456	BENZO [A] PYRENE	0.25	13	0.840
BBFANT	99454	BENZO [B] FLUORANTHENE	0.21	3.3	0.785
BBZP	99463	BUTYLBENZYL PHTHALATE	0.17	6.7	0.963
BGHIPY	99691	BENZO [G,H,I] PERYLENE	0.25	3.3	1.020
BKFANT	99454	BENZO [K] FLUORANTHENE	0.066	0.67	0.964
CHRY	99690	CHRYZENE	0.12	6.7	0.816
CL6BZ	99478	HEXACHLOROBENZENE	0.033	6.7	0.907
CL6CP	98647	HEXACHLOROCYCLOPENTADIENE	6.2	13	0.131
CL6ET	99480	HEXACHLOROETHANE	0.15	13	0.716
DBAHA	99466	DIBENZ [A,H] ANTHRACTHENE	0.21	13	0.999
DEP	99472	DIETHYL PHTHALATE	0.24	6.7	0.927
DMP	99473	DIMETHYL PHTHALATE	0.17	13	0.890
DNBP	99467	DI-N-BUTYL PHTHALATE	0.061	3.3	0.935
FANT	99689	FLUOROANTHENE	0.068	13	0.863
FLRENE	99692	FLUORENE	0.033	13	0.856
HCBD	99479	HEXACHLOROBUTADIENE	0.23	13	0.747
ICDPYR	99482	INDENO [1,2,3-CD] PYRENE	0.29	13	0.948
ISOPHR	99483	ISOPHORONE	0.033	13	0.833
NAP	99696	NAPHTHALENE	0.037	3.3	0.858
NB	99485	NITROBENZENE	0.045	13	0.840
NNDNPA	99487	N-NITROSO, DI-N-PROPYLAMINE	0.2	13	0.849
NNDPA	99488	N-NITROSODIPHENYLAMINE	0.19	13	0.848
PCP	99682	PENTACHLOROPHENOL	1.3	6.7	0.790
PHANTR	99489	PHENANTHRENE	0.033	13	0.969
PHENOL	99685	PHENOL	0.11	3.3	0.811
PYR	99490	PYRENE	0.033	3.3	0.845

Source: Hunter/ESE, 1990

Table 1 (Page 2 of 2)

LM18
EXTRACTABLE ORGANICS IN SOIL BY GC/MS

SHORT NAME	STORET	LONG NAME	CRL	UCR	SLOPE
246TCP	99684	2,4,6-TRICHLOROPHENOL	0.17	13	0.948
26DNT	99475	2,6-DINITROTOLUENE	0.085	13	0.954
DNOP	99476	DI-N-OCTYL PHTHALATE	0.19	6.7	0.712

NON-CERTIFIED ANALYTES			NON-CERTIFIED CRL
BENZID	99457	BENZIDINE	0.85
NNDMEA	99486	N-NITROSODIMETHYLAMINE	0.14
12DPH	99477	1,2-DIPHENYL HYDRAZINE	0.14

CRL CERTIFIED REPORTING LIMIT IN (micrograms per gram)
UCR UPPER CERTIFIED RANGE IN (micrograms per gram)
SLOPE REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE

Source: Hunter/ESE, 1990

LM18
EXTRACTABLE ORGANICS IN SOIL BY GC/MS
SURROGATES

SHORT NAME	STORET	LONG NAME	CRL	UCR	SLOPE	CONTROL LIMITS MAA LCL	UCL	MAP
246TBP	97448	2,4,6-TRIBROMOPHENOL	0.38	13	0.910	77.4	106.9	37.2
2FBP	98814	2-FLUOROBIPHENYL	0.021	6.7	0.903	65.7	113.8	60.5
2FP	98325	2-FLUOROPHENOL	0.17	13	0.744	61.2	89.5	35.7
NBD5	97022	NITROBENZENE-D5	0.025	6.7	0.858	70.9	103.3	40.8
TRPD14	97449	TERPHENOL-D14	0.34	6.7	1.070	84.6	113.4	36.2
PHEND6	97023	PHENOL-D6	0.23	13	0.824	66.1	98.2	40.4

NOTE: ALL CONTROL LIMITS ARE SUBJECT TO CHANGE AS PER THE USATHAMA QA PLAN CONTROL CHART PROTOCOL

CRL	CERTIFIED REPORTING LIMIT IN (micrograms per gram)
UCR	UPPER CERTIFIED RANGE IN (micrograms per gram)
SLOPE	REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE
MAA.	MOVING AVERAGE ACCURACY (percent recovery)
LCL	LOWER CONTROL LIMIT OF THE ACCURACY
UCL	UPPER CONTROL LIMIT OF THE ACCURACY
MAP.	MOVING AVERAGE PRECISION

Source: Hunter/ESE, 1990

VOLATILE ORGANICS IN SOIL BY GC/MS AND GC CRLs (METHODS LM19 AND LO02)

SHORT NAME	STORET	LONG NAME	LM19* CRL	LM19* UCR	LO02+ CRL	LO02+ UCR
111TCE	98692	1,1,1-TRICHLOROETHANE	4.4	200	0.040	5.0
112TCE	98693	1,1,2-TRICHLOROETHANE	5.4	200	0.081	5.0
11DCE	98789	1,1-DICHLOROETHENE	3.9	100	0.051	5.0
11DCLE	98683	1,1-DICHLOROETHANE	2.3	200	0.055	5.0
12DCE	97721	1,2-DICHLOROETHENE	3.0	100	-.-	-
12DCLE	98684	1,2-DICHLOROETHANE	1.7	200	0.070	5.0
12DCLP	98790	1,2-DICHLOROPROPANE	2.9	200	0.043	5.0
ACET	97020	ACETONE	17.0	100	-.-	-
BRDCLM	98783	BROMODICHLOROMETHANE	2.9	200	0.047	5.0
C13DCP	98791	CIS-1,3-DICHLOROPROPENE	3.2	248	0.062	5.0
C2AVE	97723	VINYL ACETATE	3.2	100	-.-	-
C2H3CL	98795	VINYL CHLORIDE	6.2	200	0.031	5.00
C2H5CL	98786	CHLOROETHANE	12.0	200	0.029	5.0
C6H6	98699	BENZENE	1.5	200	0.085	5.0
CCL3F	98794	TRICHLOROFLUOROMETHANE	5.9	100	0.037	5.0
CCL4	98680	CARBON TETRACHLORIDE	7.0	200	0.044	5.0
CH2CL2	98689	METHYLINE CHLORIDE	12.0	200	0.083	5.0
CH3BR	98785	BROMOMETHANE	5.7	200	0.031	5.0
CH3CL	98787	CHLOROMETHANE	8.8	100	0.18	5.0
CHBR3	98784	BROMOFORM	6.9	200	0.89	5.0
CHCL3	98682	CHLOROFORM	0.87	200	0.038	5.0
CLC6H5	98681	CHLOROBENZENE	0.86	200	0.026	5.0
CS2	97472	CARBON DISULFIDE	4.4	100	-.-	-
DBRCLM	98788	DIBROMOCHLOROMETHANE	3.1	200	0.081	5.0
ETC6H5	98688	ETHYLBENZENE	1.7	200	0.062	5.0
MEC6H5	98691	TOLUENE	0.78	200	0.028	5.0
MEK	98801	METHYL ETHYL KETONE	70.0	200	-.-	-
MIBK	98696	METHYL ISOBUTYL KETONE	27.0	100	-.-	-
MNBK	97722	METHYL-N-BUTYL KETONE	32.0	100	-.-	-
STYR	97734	STYRENE	2.6	200	-.-	-
T13DCP	98792	TRANS-1,3-DICHLOROPROPENE	2.8	152	0.081	5.0
TCLEA	98793	1,1,2,2-TETRACHLOROETHANE	2.4	200	0.045	5.0
TCLEE	98690	TETRACHLOROETHENE	0.81	200	0.045	5.0
TRCLE	98694	TRICHLOROETHENE	2.8	200	0.049	5.0
XYLEN	97724	XYLENE	1.5	200	0.086	10.0
CL2BC	98803	DICHLOROBENZENE (TOTAL)	NC 100	-	0.060	10.0
ACROLN	97028	ACROLEIN	NC 100	-	-.-	-
ACRYLO	97029	ACRYLONITRILE	NC 100	-	-.-	-
2CLEVE	98796	2-CHLOROETHYLVINYL ETHER	-.-	-	0.075	5.0
CCL2F2		DICHLORODIFLUOROMETHANE	-.-	-	0.032	5.0
T12DCE		TRANS-1,2-DICHLOROETHENE	-.-	-	0.063	5.0
13DCLB		1,3-DICHLOROBENZENE	-.-	-	0.032	5.0
13DMB		m-XYLENE	-.-	-	0.056	10.0

NOTE: ALL LIMITS ARE SUBJECT TO CHANGE AS PER THE USATHAMA QA PLAN CONTROL CHART PROTOCOL

CRL CERTIFIED REPORTING LIMIT IN
UCR UPPER CERTIFIED RANGE IN
NC NON-CERTIFIED ANALYTES FOR METHOD LM19 ONLY
* THE CONCENTRATIONS FOR LM19 ARE IN UG/KG
\+ THE CONCENTRATIONS FOR LO02 ANR IN UG/G

Source: Hunter/ESE, 1990

Table 4 (Page 1 of 1)

LM19
VOLATILE ORGANICS IN SOIL BY GC/MS

SHORT NAME	STORET	LONG NAME	CRL	UCR	SLOPE
111TCE	98692	1,1,1-TRICHLOROETHANE	4.4	200	1.200
112TCE	98693	1,1,2-TRICHLOROETHANE	5.4	200	1.100
11DCE	98789	1,1-DICHLOROETHENE	3.9	200	1.070
11DCLE	98683	1,1-DICHLOROETHANE	2.3	200	1.030
12DCE	97721	1,2-DICHLOROETHENE	3.0	100	0.986
12DCLE	98684	1,2-DICHLOROETHANE	1.7	200	1.020
12DCLP	98790	1,2-DICHLOROPROPANE	2.9	200	1.100
ACET	97020	ACETONE	17.0	100	0.970
BRDCLM	98783	BROMODICHLOROMETHANE	2.9	200	1.180
C13DCP	98791	CIS-1,3-DICHLOROPROPENE	3.2	248	1.130
C2AVE	97723	VINYL ACETATE	3.2	100	1.370
C2H3CL	98795	VINYL CHLORIDE	6.2	200	1.090
C2H5CL	98786	CHLOROETHANE	12.0	000	1.050
C6H6	98699	BENZENE	1.5	200	1.020
CCL3F	98794	TRICHLOROFLUOROMETHANE	5.9	100	1.170
CCL4	98680	CARBON TETRACHLORIDE	7.0	200	1.270
CH2CL2	98689	METHYLINE CHLORIDE	12.0	200	0.988
CH3BR	98785	BROMOMETHANE	5.7	200	0.891
CH3CL	98787	CHLOROMETHANE	8.8	100	0.882
CHBR3	98784	BROMOFORM	6.9	200	1.330
CHCL3	98682	CHLOROFORM	0.87	200	1.030
CLC6H5	98681	CHLOROBENZENE	0.86	200	1.070
CS2	97472	CARBON DISULFIDE	4.4	100	0.993
DBRCLM	98788	DIBROMOCHLOROMETHANE	3.1	200	1.230
ETC6H5	98688	ETHYLBENZENE	1.7	200	1.030
MEC6H5	98691	TOLUENE	0.78	200	1.020
MEK	98801	METHYL ETHYL KETONE	70.0	200	1.140
MIBK	98696	METHYL ISOBUTYL KETONE	27.0	100	1.300
MNBK		METHYL-N-BUTYL KETONE	32.0	100	1.240
STYR	97734	STYRENE	2.6	200	1.030
T13DCP	98792	TRANS-1,3-DICHLOROPROPENE	2.8	152	1.150
TCLEA	98793	1,1,2,2-TETRACHLOROETHANE	2.4	200	1.130
TCLEE	98690	TETRACHLOROETHENE	0.81	200	1.030
TRCLE	98694	TRICHLOROETHENE	2.8	200	1.160
XYLEN	97724	XYLENE	1.5	200	1.010

NON-CERTIFIED ANALYTES			NON-CERTIFIED CRL
CL2BC	98803	DICHLOROBENZENE (TOTAL)	100
ACROLN	97028	ACROLEIN	100
ACRYLO	97029	ACRYLONITRILE	100

CRL CERTIFIED REPORTING LIMIT IN (micrograms per kilo-grams)
UCR UPPER CERTIFIED RANGE IN (micrograms per kilo-grams)
SLOPE REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE

Source: Hunter/ESE, 1990

Table 5 (Page 1 of 1)

LM19
VOLATILE ORGANICS IN SOIL BY GC/MS

SURROGATES

SHORT NAME	STORET	LONG NAME	CRL	UCR	SLOPE	CONTROL LIMITS MAA LCL	UCL	MAP
12DCD4		1,2-DICHLOROETHANE-D4	3.2	200	0.995	91.0	103.2	15.4
4BFB		4-BROMOFLUOROBENZENE	2.9	200	1.100	91.0	107.8	21.1
MEC6D8		TOLUENE-D8	1.5	200	0.999	87.0	109.4	28.1

NOTE: ALL CONTROL LIMITS ARE SUBJECT TO CHANGE AS PER THE USATHAMA QA PLAN CONTROL CHART PROTOCOL

CRL CERTIFIED REPORTING LIMIT IN (micrograms per kilo-grams)
UCR UPPER CERTIFIED RANGE IN (micrograms per kilo-grams)
SLOPE REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE
MAA. MOVING AVERAGE ACCURACY (percent recovery)
LCL LOWER CONTROL LIMIT OF THE ACCURACY
UCL UPPER CONTROL LIMIT OF THE ACCURACY
MAP. MOVING AVERAGE PRECISION

Source: Hunter/ESE, 1990

LO02

VOLATILE ORGANICS IN SOIL BY GC

SHORT NAME		STORET	LONG NAME	CRL	UCR	SLOPE
111TCE	@	98692	1,1,1-TRICHLOROETHANE	0.04	5.0	0.988
112TCE		98693	1,1,2-TRICHLOROETHANE	0.081	5.0	0.957
11DCE	@	98789	1,1-DICHLOROETHENE	0.051	5.0	0.941
11DCLE		98683	1,1-DICHLOROETHANE	0.055	5.0	0.948
12DCLE		98684	1,2-DICHLOROETHANE	0.071	5.0	0.902
12DCLP		98790	1,2-DICHLOROPROPANE	0.043	5.0	1.00
2CLEVE		98796	2-CHLOROETHYLVINYL ETHER	0.075	5.0	0.799
BRDCLM		98783	BROMODICHLOROMETHANE	0.047	5.0	0.921
C13DCP		98791	CIS-1,3-DICHLOROPROPENE	0.062	5.0	0.860
C2H3CL		98795	VINYL CHLORIDE	0.031	5.0	0.921
C2H5CL		98786	CHLOROETHANE	0.029	5.0	0.961
C6H6	@	98699	BENZENE	0.085	5.0	0.952
CCL3F		98794	TRICHLOROFLUOROMETHANE	0.037	5.0	0.929
CCL4		98680	CARBON TETRACHLORIDE	0.044	5.0	0.965
CH2CL2		98689	METHYLINE CHLORIDE	0.083	5.0	0.956
CH3BR		98785	BROMOMETHANE	0.031	5.0	0.899
CH3CL		98787	CHLOROMETHANE	0.18	5.0	0.933
CHBR3		98784	BROMOFORM	0.031	5.0	0.856
CHCL3	@	98682	CHLOROFORM	0.038	5.0	0.969
CLC6H5	@	98681	CHLOROBENZENE	0.026	5.0	0.925
DBRCLM		98788	DIBROMOCHLOROMETHANE	0.081	5.0	0.957
ETC6H5	@	98688	ETHYLBENZENE	0.062	5.0	1.03
MEC6H5	@	98691	TOLUENE	0.028	5.0	0.970
T13DCP		98792	TRANS-1,3-DICHLOROPROPENE	0.081	5.0	0.957
TCLEA		98793	1,1,2,2-TETRACHLOROETHANE	0.045	5.0	0.906
TCLEE	@	98690	TETRACHLOROETHENE	0.045	5.0	0.906
TRCLE	@	98694	TRICHLOROETHENE	0.049	5.0	0.972
XYLEN		97353	XYLENE	0.086	10	1.01
13DCLB		99468	1,3-DICHLOROBENZENE	0.032	5.0	1.01
13DMB		98799	1,3-DIMETHYLBENZENE/M-XYLENE	0.056	5.0	1.01
CCL2F2		97015	DICHLORODIFLUOROMETHANE	0.032	5.0	0.921
CL2BZ		98803	DICHLOROBENZENE	0.06	10	0.990
T12DCE		98687	TRANS-1,2-DICHLOROETHYLENE	0.063	5.0	0.948

@	THESE ARE THE CONTROL ANALYTES FOR THIS METHOD
CRL	CERTIFIED REPORTING LIMIT IN (micrograms per gram)
UCR	UPPER CERTIFIED RANGE IN (micrograms per gram)
SLOPE	REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE

Source: Hunter/ESE, 1990

Table 7 (Page 1 of 1)

JS11
METALS IN SOIL BY ICAP

SHORT NAME	STORET	LONG NAME	CRL	UCR	SLOPE	CONTROL LIMITS MAA LCL	CONTROL LIMITS MAA UCL	MAP	ACCU. LCL	ACCU. UCL	PREC
AC •	1078	SILVER	2.50	50.0	0.965	88.0	118.7	38.6	81.5	110.4	25
AL	1108	ALUMINUM	14.10	5000.0	1.00						
BA	1008	BARIUM	29.6	200.0	0.629						
BE •	1013	BERYLLIUM	1.86	20.0	0.739	40.3	109.5	87.0	67.2	73.4	9
CD •	1028	CADMIUM	3.05	20.0	0.826	46.6	113.8	84.6	29.1	83.8	47
CO	1038	COBALT	15.0	5000.0	0.608						
CR •	99584	CHROMIUM	12.7	5000.0	0.613	40.8	74.8	42.7	56.5	72.2	13.7
CU •	1043	COPPER	58.6	5000.0	0.675	31.3	89.9	73.6	25.8	120.5	82
MO	99224	MOLYBDENUM	1.15	5000.0	0.650						
NI •	1068	NICKEL	12.6	5000.0	0.593	38.9	75.0	45.4	54.8	73.3	16.0
PB •	1052	LEAD	6.62	50.0	1.05	91.0	126.4	43.8	91.7	119.8	24
SB	1098	ANTIMONY	3.8	5000.0	0.581						
TL •	34480	THALLIUM	31.3	5000.0	0.580	44.9	83.3	48.3	24.3	118.9	82.2
V	1088	VANADIUM	13.0	5000.0	0.650						
ZN •	1093	ZINC	30.2	5000.0	0.573	88.0	118.7	38.6	81.5	110.4	25

• THESE ELEMENTS ARE THE CONTROL SPIKES FOR THIS METHOD

NOTE: ALL CONTROL LIMITS ARE SUBJECT TO CHANGE AS PER THE USATHAMA QA PLAN CONTROL CHART PROTOCOL

CRL	CERTIFIED REPORTING LIMIT IN (micrograms per gram)
UCR	UPPER CERTIFIED RANGE IN (micrograms per gram)
SLOPE	REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE
MAA.	MOVING AVERAGE ACCURACY (percent recovery)
LCL	LOWER CONTROL LIMIT OF THE ACCURACY
UCL	UPPER CONTROL LIMIT OF THE ACCURACY
MAP.	MOVING AVERAGE PRECISION
PREC.	PRECISION OF THE REPLICATE HIGH SPIKE
ACCU.	ACCURACY OF THE REPLICATE HIGH SPIKE

Source: Hunter/ESE, 1990

Table 8 Metals in Soil by Atomic Absorption

Short Name	Long Name	Method	CRL	UCR	Slope
AS	Arsenic	JD19	0.25	10.0	0.842
SE	Selenium	JD15	0.25	10.0	0.757
PB	Lead	JD17	0.177	10.0	0.890
AG	Silver	JD18	0.025	1.00	0.882
HG	Mercury	JB01	0.05	1.00	1.02

Note: CRL - Certified Reporting Limit in micrograms per gram.
UCR - Upper Certified Range in micrograms per gram.
Slope - Represents average accuracy over the certified range.

Source: Hunter/ESE, 1990.

Table 9 (Page 1 of 1)

LH10
ORGANOCHLORINE PESTICIDES IN SOIL BY GC-EC

SHORT NAME		STORET	LONG NAME	CRL	UCR	SLOPE
ABHC		98357	BHC, A	9.07	27	0.919
AENSLF	*	98366	ENDOSULFAN, A	6.01	24.4	1.030
ALDRN	*	98356	ALDRIN	7.29	25.7	0.988
BBHC		98358	BHC, B	2.57	25.4	0.975
BENSLF	*	98367	ENDOSULFAN, B	6.63	24.4	1.100
DBHC		98359	BHC, D	5.55	25.2	1.280
DLDRN	*	98365	DIELDRIN	6.29	25.4	1.040
ENDRN	*	98369	ENDRIN	6.57	25.2	1.090
ENDRNA		98370	ENDRIN ALDEHYDE	24.0	30.2	0.871
ESFSO4		98368	ENDOSULFAN SULFATE	7.63	28.6	1.060
HPCL	*	98371	HEPTACHLOR	6.18	26.2	1.040
HPCLE		98372	HEPTACHLOR EPOXIDE	6.2	26.0	1.040
LIN	*	98360	LINDANE	6.38	26.2	1.030
MEXCLR	*	97818	METHOXYCHLOR	71.1	249.0	1.200
PPDDD		98362	DDD-PP	8.26	24.6	1.110
PPDDE		98363	DDE-PP	7.65	28.6	1.060
PPDDT	*	98364	DDT-PP	7.07	28.1	1.010
TXPHEN		98373	TOXAPHENE	444	1120	1.350
ISODR	*	98649	ISODRIN	4.61	41.2	0.941
CLDAN		98361	CHLORDANE	17.7	197	0.839

*	THESE ARE USED AS CONTROL ANALYTES FOR THIS METHOD
CRL	CERTIFIED REPORTING LIMIT IN (micrograms per kilo-grams)
UCR	UPPER CERTIFIED RANGE IN (micrograms per kilo-gram)
SLOPE	REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE

Source: Hunter/ESE, 1990

Table 10 (Page 1 of 1)

LH16
PCBs IN SOIL BY GCEC

SHORT NAME	STORET	LONG NAME		CRL	UCR	SLOPE
PCB016	98140	PCB 1016		66.6	367	1.13
PCB260	98139	PCB 1260		80.4	407	1.06
PCB221	98351	PCB 1221	NC	66.6		
PCB232	98352	PCB 1232	NC	66.6		
PCB242	98353	PCB 1242	NC	80.4		
PCB248	98802	PCB 1248	NC	80.4		
PCB254	98354	PCB 1254	NC	80.4		

CRL CERTIFIED REPORTING LIMIT IN (micrograms per kilogram)
UCR UPPER CERTIFIED RANGE IN (micrograms per kilogram)
SLOPE REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE
NC NON-CERTIFIED ANALYTES AND RLs

Source: Hunter/ESE, 1990

Table 11 (Page 1 of 1)

LW12

NITROAROMATICS IN SOIL BY HPLC

SHORT NAME	LONG NAME	CRL	UCR	SLOPE	CONTROL LIMITS MAA LCL	MAA UCL	MAP	ACCU LCL	ACCU UCL	[illegible]
135TNB*	1,3,5-TRINITROBENZENE	0.488	24.4	0.991	74.7	91.2	25.0	90.6	99.6	[illegible]
13DNB	1,3-DINITROBENZENE	0.496	24.8	0.952						
246TNT	2,4,6-TRINITROTOLUENE	0.456	22.8	1.01						
24DNT *	2,4-DINITRIROLUENE	0.424	21.2	0.938	84.1	105.7	21.7	76.9	88.1	[illegible]
26DNT	2,6-DINITROTOLUENE	0.524	26.2	0.977						
HMX	CYCLOTETRAMETHYLENE TETRANITRAMINE	0.666	33.3	1.000						
NB	* NITROBENZENE	2.41	27.4	0.793	68.9	95.9	27.1	69.7	82.5	[illegible]
RDX	* CYCLONITE	0.587	21.9	0.929	67.2	101.8	43.5	71.5	82.5	[illegible]
TETRYL	NITRAMINE	0.731	20.2	1.130						

* THESE COMPOUNDS ARE THE CONTROL SPIKES FOR THIS METHOD

NOTE: ALL CONTROL LIMITS ARE SUBJECT TO CHANGE AS PER THE USATHAMA QA PLAN CONTROL CHART PROTOCOL

CRL	CERTIFIED REPORTING LIMIT IN (microgram per gram)
UCR	UPPER CERTIFIED RANGE IN (micrograms per gram)
SLOPE	REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE
MAA	MOVING AVERAGE ACCURACY (percent recovery)
LCL	LOWER CONTROL LIMIT OF THE ACCURACY
UCL	UPPER CONTROL LIMIT OF THE ACCURACY
MAP	MOVING AVERAGE PRECISION
PREC	PRECISION OF THE REPLICATE HIGH SPIKES
ACCU	ACCURACY OF THE REPLICATE HIGH SPIKES

Source: Hunter/ESE, 1990

Table 12 - (Page 1 of 2)

UM18
EXTRACTABLE ORGANICS IN WATER BY GC/MS

SHORT NAME	STORET	LONG NAME	CRL	UCR	SLOPE
124TCB	34551	1,2,4-TRICHLOROBENZENE	1.8	50	0.824
12DCLB	34536	1,2-DICHLOROBENZENE	1.7	50	0.856
13DCLB	34566	1,3-DICHLOROBENZENE	1.7	200	0.790
14DCLB	34571	1,4-DICHLOROBENZENE	1.7	200	0.786
24DCLP	34601	2,4-DICHLOROPHENOL	2.9	200	0.930
24DMPN	34606	2,4-DIMETHYLPHENOL	5.8	100	0.938
24DNP	34616	2,4-DINITROPHENOL	21.0	100	1.370
24DNT	34611	2,4-DINITROTOLUENE	4.5	200	0.954
2CLP	34586	2-CHLOROPHENOL	0.99	200	0.967
2CNAP	34581	2-CHLORONAPHTHALENE	0.5	200	0.880
2NP	34591	2-NITROPHENOL	3.7	100	0.986
33DCBD	34631	3,3-DICHLOROBENZIDINE	12.0	100	1.530
46DN2C	34657	2-METHYL-4,6-DINITROPHENOL	17.0	100	1.220
4BRPPE	34636	4-BROMOPHENYLPHENYL ETHER	4.2	100	0.902
4CL3C	34452	3-METHYL-4-CHLOROPHENOL	4.0	200	0.989
4CLPPE	34641	4-CHLOROPHENYLPHENYL ETHER	5.1	100	0.856
4NP	34646	4-NITROPHENOL	12.0	100	0.662
ANAPYL	34200	ACENAPHTHYLENE	0.5	50	0.966
ANTRC	34220	ANTHRACENE	0.5	100	0.974
B2CEXM	34278	BIS(2-CHLOROETHOXY) METHANE	1.5	50	0.928
B2CIPE	34283	BIS(2-CHLOROISOPROPYL) ETHER	5.3	200	0.834
B2CLEE	34273	BIS(2-CHLOROETHYL) ETHER	1.9	50	0.943
BAANTR	34526	BENZO [A] ANTHRACENE	1.6	100	0.996
BAPYR	34247	BENZO [A] PYRENE	4.7	100	1.120
BBFANT	34230	BENZO [B] FLUORANTHENE	5.4	50	1.050
BBZP	34292	BUTYLBENZYL PHTHALATE	3.4	100	1.060
BGHIPY	34521	BENZO [G,H,I] PERYLENE	6.1	50	1.300
BKFANT	34242	BENZO [K] FLUORANTHENE	0.87	100	1.020
CHRY	34320	CHRYZENE	2.40	100	0.967
CL6BZ	39700	HEXACHLOROBENZENE	1.6	100	0.949
CL6CP	34386	HEXACHLOROCYCLOPENTADIENE	8.6	100	0.707
CL6ET	34396	HEXACHLOROETHANE	1.5	50	0.818
DBAHA	34556	DIBENZ [A,H] ANTHRACTHENE	6.5	50	1.160
DEP	34336	DIETHYL PHTHALATE	2.0	200	0.863
DMP	34341	DIMETHYL PHTHALATE	1.5	100	0.807
DNBP	39110	DI-N-BUTYL PHTHALATE	3.7	200	1.100
FANT	34376	FLUOROANTHENE	3.3	100	0.996
FLRENE	34381	FLUORENE	3.7	50	0.960
HCBD	34391	HEXACHLOROBUTADIENE	3.4	100	0.731
ICDPYR	34403	INDENO [1,2,3-CD] PYRENE	8.6	100	1.170
ISOPHR	34408	ISOPHORONE	4.8	50	0.971
NAP	34696	NAPHTHALENE	0.5	20	1.150
NB	34447	NITROBENZENE	0.5	50	0.887
NNDNPA	34428	N-NITROSO, DI-N-PROPYLAMINE	4.4	50	0.987
NNDPA	34433	N-NITROSODIPHENYLAMINE	3.0	200	0.956
PCP	39032	PENTACHLOROPHENOL	18.0	100	1.260
PHANTR	34461	PHENANTHRENE	0.5	100	1.000
PHENOL	34694	PHENOL	9.2	200	0.542
PYR	34469	PYRENE	2.8	100	0.995

Source: Hunter/ESE, 1990

UM18
EXTRACTABLE ORGANICS IN WATER BY GC/MS

SHORT NAME	STORET	LONG NAME	CRL	UCR	SLOPE
246TCP	34621	2,4,6-TRICHLOROPHENOL	4.2	100	1.02
26DNT	34626	2,6-DINITROTOLUENE	0.79	200	1.09
DNOP	34596	DI-N-OCTYL PHTHALATE	15.0	100	1.28

NON-CERTIFIED ANALYTES			NON-CERTIFIED CRL
BENZID	39120	BENZIDINE	10.0
NNDMEA	34438	N-NITROSODIMETHYLAMINE	2.0
12DPH	34346	1,2-DIPHENYL HYDRAZINE	2.0

CRL CERTIFIED REPORTING LIMIT IN (micrograms per liter)
UCR UPPER CERTIFIED RANGE IN (micrograms per liter)
SLOPE REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE

UM18
EXTRACTABLE ORGANICS IN WATER BY GC/MS

SURROGATES

SHORT NAME	STORET	LONG NAME	CRL	UCR	SLOPE	CONTROL LIMITS MAA LCL	CONTROL LIMITS MAA UCL	MAP
246TBP		2,4,6-TRIBROMOPHENOL	13.0	200	1.260	64.3	107.6	54.5
2FBP	98321	2-FLUOROBIPHENYL	12.0	100	0.891	65.8	100.8	44.0
2FP	98316	2-FLUOROPHENOL	17.0	200	0.657	50.6	87.1	46.0
NBD5	98318	NITROBENZENE-D5	11.0	100	0.845	66.5	102.0	44.6
TRPD14	97447	TERPHENOL-D14	14.0	100	0.878	78.0	112.0	42.8
PHEND6	98317	PHENOL-D6	36.0	200	0.50	38.8	63.3	30.9

NOTE: ALL CONTROL LIMITS ARE SUBJECT TO CHANGE AS PER THE USATHAMA QA PLAN CONTROL CHART PROTOCOL

CRL CERTIFIED REPORTING LIMIT IN (micrograms per liter)
UCR UPPER CERTIFIED RANGE IN (microgram per liter)
SLOPE REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE
MAA. MOVING AVERAGE ACCURACY (percent recovery)
LCL LOWER CONTROL LIMIT OF THE ACCURACY
UCL UPPER CONTROL LIMIT OF THE ACCURACY
MAP. MOVING AVERAGE PRECISION

Source: Hunter/ESE, 1990

VOLATILE ORGANICS IN WATER BY GC/MS AND GC
CRLs (METHODS UM20 AND UO02)

SHORT NAME	STORET	LONG NAME		UM20 CRL	UM20 UCR	UO02 CRL	UO02 UCR
111TCE	34506	1,1,1-TRICHLOROETHANE		0.5	200	2.90	50.0
112TCE	34511	1,1,2-TRICHLOROETHANE		1.2	200	0.667	49.0
11DCE	34501	1,1-DICHLOROETHENE		0.50	200	0.773	51.0
11DCLE	34496	1,1-DICHLOROETHANE		0.68	200	0.709	49.5
12DCLE	34531	1,2-DICHLOROETHANE		0.50	50	2.95	49.0
12DCLP	34541	1,2-DICHLOROPROPANE		0.50	200	3.16	49.0
2CLEVE	34576	2-CHLOROETHYLVINYL ETHER		0.71	200	22.1	49.5
BRDCLM	32101	BROMODICHLOROMETHANE		0.59	200	3.06	50.5
C13DCP	34704	CIS-1,3-DICHLOROPROPENE		0.58	230	3.23	48.5
C2H3CL	39175	VINYL CHLORIDE		2.6	200	2.07	50.0
C2H5CL	34311	CHLOROETHANE		1.9	200	1.60	50.0
C6H6	34030	BENZENE		0.50	200	2.85	49.0
CCL3F	34488	TRICHLOROFLUOROMETHANE		1.4	50	0.828	51.5
CCL4	32102	CARBON TETRACHLORIDE		0.58	200	2.81	49.0
CH2CL2	34423	METHYLINE CHLORIDE		2.3	100	3.10	49.0
CH3BR	34413	BROMOMETHANE		5.8	100	2.68	50.0
CH3CL	34418	CHLOROMETHANE		3.2	200	1.98	50.0
CHBR3	32104	BROMOFORM		2.60	200	4.03	52.0
CHCL3	32106	CHLOROFORM		0.5	200	1.26	50.0
CLC6H5	34301	CHLOROBENZENE		0.5	200	0.928	50.5
DBRCLM	32105	DIBROMOCHLOROMETHANE		0.67	100	0.709	51.5
ETC6H5	34371	ETHYLBENZENE		0.5	200	0.990	49.5
MEC6H5	34010	TOLUENE		0.5	200	0.990	49.5
T13DCP	34699	TRANS-1,3-DICHLOROPROPENE		0.70	280	0.675	49.5
TCLEA	34516	1,1,2,2-TETRACHLOROETHANE		0.51	200	1.09	52.0
TCLEE	34475	TETRACHLOROETHENE		1.6	200	0.677	51.0
TRCLE	39180	TRICHLOROETHENE		0.50	200	3.59	50.0
XYLEN	99649	XYLENE		0.84	200	2.04	102.0
ACET	81552	ACETONE		13.0	200	-.-	–
CS2	77041	CARBONDISULFIDE		0.5	200	-.-	–
12DCE	99642	1,2-DICHLOROETHENE (TOTAL)		0.5	200	-.-	–
MEK	81595	2-BUTANONE		6.4	200	-.-	–
C2AVE	77057	VINYL ACETATE		8.3	50	-.-	–
MIBK	81596	4-METHYL-2-PENTANONE		3.0	200	-.-	–
MNBK	77103	2-HEXANONE		3.6	200	-.-	–
STYR	77128	STYRENE		0.5	200	-.-	–
CL2BZ	81524	DICHLOROBENZENE	NC	10	–	5.55	111.0
ACROLN	34210	ACROLEIN	NC	100	–	-.-	–
ACRYLO	34215	ACRYLONITRILE	NC	100	–	-.-	–
CCL2F2		DICHLORODIFLUOROMETHANE		-.-	–	2.04	50
T12DCE		TRANS-1,2-DICHLOROETHENE		-.-	–	0.735	49.0
13DCLB		m-DICHLOROBENZENE		-.-	–	2.50	50.0
13DMB		m-XYLENE		-.-	–	2.49	49.5

NOTE: ALL CONTROL LIMITS ARE SUBJECT TO CHANGE AS PER THE USATHAMA QA PLAN CONTROL CHART PROTOCOL

CRL CERTIFIED REPORTING LIMIT IN (micrograms per liter)
UCR UPPER CERTIFIED RANGE IN (micrograms per liter)
NC NON-CERTIFIED ANALYTES FOR METHOD UM20 ONLY

Source: Hunter/ESE, 1990

UM20
VOLATILE ORGANICS IN WATER BY GC/MS

SHORT NAME	STORET	LONG NAME	CRL	UCR	SLOPE
111TCE	34506	1,1,1-TRICHLOROETHANE	0.5	200	1.010
112TCE	34511	1,1,2-TRICHLOROETHANE	1.2	200	0.943
11DCE	34501	1,1-DICHLOROETHENE	0.5	200	1.060
11DCLE	34496	1,1-DICHLOROETHANE	0.68	200	0.983
12DCE	99642	1,2-DICHLOROETHENE	0.5	200	1.030
12DCLE	34531	1,2-DICHLOROETHANE	0.5	50	0.995
12DCLP	34541	1,2-DICHLOROPROPANE	0.5	200	1.020
2CLEVE	34576	2-CHLOROETHYLVINYL ETHER	0.71	200	1.010
ACET	81552	ACETONE	13.0	50	0.907
BRDCLM	32101	BROMODICHLOROMETHANE	0.59	200	1.020
C13DCP	34704	CIS-1,3-DICHLOROPROPENE	0.58	230	1.020
C2AVE	77057	VINYL ACETATE	8.3	50	0.984
C2H3CL	39175	VINYL CHLORIDE	2.6	200	0.964
C2H5CL	34311	CHLOROETHANE	1.9	200	0.980
C6H6	34030	BENZENE	0.5	200	1.010
CCL3F	34488	TRICHLOROFLUOROMETHANE	1.4	50	0.998
CCL4	32102	CARBON TETRACHLORIDE	0.58	200	1.050
CH2CL2	34423	METHYLINE CHLORIDE	2.3	100	1.060
CH3BR	34413	BROMOMETHANE	5.8	100	1.010
CH3CL	34418	CHLOROMETHANE	3.2	200	0.952
CHBR3	32104	BROMOFORM	2.6	200	1.050
CHCL3	32106	CHLOROFORM	0.5	200	0.975
CLC6H5	34301	CHLOROBENZENE	0.5	200	1.040
CS2	77041	CARBON DISULFIDE	0.5	200	0.882
DBRCLM	32105	DIBROMOCHLOROMETHANE	0.67	100	0.981
ETC6H5	34371	ETHYLBENZENE	0.5	200	1.050
MEC6H5	34010	TOLUENE	0.5	200	1.020
MEK	81595	METHYL ETHYL KETONE	6.4	200	0.992
MIBK	81596	METHYL ISOBUTYL KETONE	3.0	200	0.918
MNBK	77103	METHYL-N-BUTYL KETONE	3.6	200	0.917
STYR	77128	STYRENE	0.5	200	1.100
T13DCP	34699	TRANS-1,3-DICHLOROPROPENE	0.7	280	0.964
TCLEA	34516	1,1,2,2-TETRACHLOROETHANE	0.51	200	1.030
TCLEE	34415	TETRACHLOROETHENE	1.6	200	0.984
TRCLE	39180	TRICHLOROETHEN	0.5	200	1.050
XYLEN	99649	XYLENE	0.84	200	1.060

NON-CERTIFIED ANALYTES			NON-CERTIFIED CRL
CL2BC	81524	DICHLOROBENZENE (TOTAL)	10
ACROLN	34210	ACROLEIN	100
ACRYLO	34215	ACRYLONITRILE	100

CRL CERTIFIED REPORTING LIMIT IN (micrograms per liter)
UCR UPPER CERTIFIED RANGE IN (micrograms per liter)
SLOPE REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE

Source: Hunter/ESE, 1990

Table 15 (Page 1 of 1)

UM20
VOLATILE ORGANICS IN WATER BY GC/MS

SURROGATES

SHORT NAME	STORET	LONG NAME	CRL	UCR	SLOPE	CONTROL LIMIT MAA LCL	CONTROL LIMIT MAA UCL	MAP
12DCD4	98812	1,2-DICHLOROETHANE-D4	23.0	200	0.881	86.2	102.8	20.9
4BFB		4-BROMOFLUOROBENZENE	6.5	200	1.110	92.2	107.2	19.3
MEC6D8	98810	TOLUENE-D8	0.5	200	1.060	92.0	110.0	22.7

NOTE: ALL CONTROL LIMITS ARE SUBJECT TO CHANGE AS PER THE USATHAMA QA PLAN CONTROL CHART PROTOCOL

CRL	CERTIFIED REPORTING LIMIT IN (micrograms per liter)
UCR	UPPER CERTIFIED RANGE IN (micrograms per liter)
SLOPE	REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE
MAA.	MOVING AVERAGE ACCURACY (percent recovery)
LCL	LOWER CONTROL LIMIT OF THE ACCURACY
UCL	UPPER CONTROL LIMIT OF THE ACCURACY
MAP.	MOVING AVERAGE PRECISION

Source: Hunter/ESE, 1990

Table 16 (Page 1 of 1)

UO02
VOLATILE ORGANICS IN WATER BY GC

SHORT NAME	STORET	LONG NAME	CRL	UCR	SLOPE
111TCE @	34506	1,1,1-TRICHLOROETHANE	2.9	50	1.08
112TCE	34511	1,1,2-TRICHLOROETHANE	0.332	49	1.10
11DCE @	34501	1,1-DICHLOROETHENE	0.393	51	1.06
11DCLE	34496	1,1-DICHLOROETHANE	0.334	49.5	1.03
12DCLE	34531	1,2-DICHLOROETHANE	2.95	49	1.08
12DCLP	34541	1,2-DICHLOROPROPANE	3.16	49	1.09
2CLEVE	34576	2-CHLOROETHYLVINYL ETHER	22.1	49.5	1.11
BRDCLM	32101	BROMODICHLOROMETHANE	3.06	50.5	1.11
C13DCP	34704	CIS-1,3-DICHLOROPROPENE	3.23	48.5	1.08
C2H3CL	39175	VINYL CHLORIDE	2.07	50	1.16
C2H5CL	34311	CHLOROETHANE	1.6	50	1.24
C6H6 @	34030	BENZENE	0.651	49	1.07
CCL3F	34488	TRICHLOROFLUOROMETHANE	0.503	51.5	1.06
CCL4	32102	CARBON TETRACHLORIDE	2.81	49	1.03
CH2CL2	34423	METHYLINE CHLORIDE	3.1	49	1.05
CH3BR	34413	BROMOMETHANE	2.68	50	1.20
CH3CL	34418	CHLOROMETHANE	1.98	50	1.04
CHBR3	32104	BROMOFORM	4.03	52	1.06
CHCL3 @	32106	CHLOROFORM	1.26	50	1.05
CLC6H5 @	34301	CHLOROBENZENE	0.582	50.5	0.988
DBRCLM	34306	DIBROMOCHLOROMETHANE	0.352	51.5	1.10
ETC6H5 @	34371	ETHYLBENZENE	0.857	49.5	0.999
MEC6H5 @	34010	TOLUENE	0.716	49.5	0.990
T13DCP	34699	TRANS-1,3-DICHLOROPROPENE	0.326	49.5	1.10
TCLEA	34516	1,1,2,2-TETRACHLOROETHANE	1.09	52	0.935
TCLEE @	34475	TETRACHLOROETHENE	0.677	51	0.996
TRCLE @	39180	TRICHLOROETHENE	3.59	50	1.05
XYLEN	81551	XYLENE	1.73	102	0.995
13DCLB	34566	1,3-DICHLOROBENZENE	1.34	50	0.921
13DMB	77348	1,3-DIMETHYLBENZENE	1.56	49.5	1.00
CCL2F2	34668	DICHLORODIFLUOROMETHANE	2.04	50	1.25
CL2BZ	81524	DICHLOROBENZENE	6.22	111	0.942
T12DCE	34546	TRANS-1,2-DICHLOROETHENE	0.427	49	1.04

@ These compounds are used as control spikes for this method.
CRL CERTIFIED REPORTING LIMIT IN (micrograms per liter)
UCR UPPER CERTIFIED RANGE IN (micrograms per liter)
SLOPE REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE

Source: Hunter/ESE, 1990

SS10
METALS IN WATER BY ICP

SHORT NAME	STORET	LONG NAME	CRL	UCR	SLOPE	CONTROL LIMITS MAA LCL	UCL	MAP	ACCU LCL	UCL	PREC
AG	1077	SILVER	4.6	2500	0.989						
AL	1105	ALUMINUM	141	45000	0.891						
B	1022	BORON	50	50000	0.880						
BA	1007	BARIUM	5	10000	1.08						
BE *	1012	BERRYLIUM	5	1000	0.893	71.8	91.8	25.2	92.1	97.1	4.3
BI	1017	BISMUTH	109	25000	1.02						
CA	82032	CALCIUM	500	20000	0.974						
CD *	1027	CADMIUM	4	5000	1.00	75.2	128.5	67.1	86.7	109.8	20.1
CO	1037	COBALT	25	50000	0.879						
CR *	1034	CHROMIUM	6	5000	1.01	94.1	135.4	52.0	92.7	105.6	11.2
CU *	1042	COPPER	8.1	10000	0.985	70.0	123.9	67.7	91.5	103.4	10.3
FE	1045	IRON	42.7	500000	0.907						
K	82034	POTASSIUM	375	12500	0.881						
MG	82033	MAGNESIUM	500	20000	0.988						
MN	1055	MANGANESE	2.75	2000	0.934						
MO	1062	MOLYBDENUM	15.3	8000	0.883						
NA	82035	SODIUM	500	50000	0.954						
NI *	1067	NICKEL	34.3	15000	0.860	88.9	103.8	18.8	93.0	96.5	3.1
PB	1051	LEAD	18.6	5000	0.945						
SB *	1097	ANTIMONY	38	6000	0.844	59.4	108.4	61.0	86.7	96.0	8.1
SE	1147	SELENIUM	71.1	75000	0.928						
TE	1064	TELLURIUM	103	2000	0.994						
TL	1059	THALLIUM	81.4	40000	0.857						
V	1087	VANADIUM	11	1000	0.958						
ZN *	1092	ZINC	21.1	20000	0.949	76.8	120.8	55.8	85.7	103.2	15.2

* THESE ELEMENTS ARE THE CONTROL SPIKES FOR THIS METHOD

NOTE: ALL CONTROL LIMITS ARE SUBJECT TO CHANGE AS PER THE USATHAMA QA PLAN CONTROL CHART PROTOCOL

CRL	CERTIFIED REPORTING LIMIT IN (micrograms per liter)
UCR	UPPER CERTIFIED RANGE IN (micrograms per liter)
SLOPE	REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE
MAA.	MOVING AVERAGE ACCURACY (percent recovery)
LCL	LOWER CONTROL LIMIT OF THE ACCURACY
UCL	UPPER CONTROL LIMIT OF THE ACCURACY
MAP.	MOVING AVERAGE PRECISION
PREC.	PRECISION OF THE REPLICATE HIGH SPIKE
ACCU.	ACCURACY OF THE REPLICATE HIGH SPIKE

Source: Hunter/ESE, 1990

Table 18 Metals in Water by Atomic Absorption

Short Name	Long Name	Method	CRL	UCR	Slope
AS	Arsenic	SD22	0.25	10.0	0.938
SE	Selenium	SD21	3.02	100	0.939
PB	Lead	SD20	1.26	100	0.922
AG	Silver	SD23	0.189	10.0	1.06
TL	Thallium	SD09	6.99	25.0	0.905
HG	Mercury	SB01	0.243	10.0	1.03

Note: CRL - Certified Reporting Limit in micrograms per liter.
UCR - Upper Certified Range in micrograms per liter.
Slope - Represents average accuracy over the certified range.

Source: Hunter/ESE, 1990.

Table 19 (Page 1 of 1)

UH13
PESTICIDES IN WATER BY GC-EC

SHORT NAME	STORET	LONG NAME	CRL	UCR	SLOPE
ABHC	39337	BHC, A	0.038	0.638	0.941
AENSLF •	34361	ENDOSULFAN, A	0.022	0.575	1.020
ALDRN •	39330	ALDRIN	0.092	0.606	0.756
BBHC	39338	BHC, B	0.018	0.600	0.891
BENSLF •	34356	ENDOSULFAN, B	0.013	0.575	1.160
CLDAN	39350	CHLORDANE	0.246	5.300	0.962
DBHC	34259	BHC, D	0.029	0.594	1.150
DLDRN •	39380	DEILDRIN	0.018	0.600	1.040
ENDRN •	39390	ENDRIN	0.018	0.594	1.320
ENDRNA	34366	ENDRIN ALDEHYDE	0.026	0.713	1.000
ESFSO4	34351	ENDOSULFAN SULFATE	0.079	0.675	0.961
HPCL •	39410	HEPTACHLOR	0.042	0.619	0.849
HPCLE	39420	HEPTACHLOR EPOXIDE	0.024	0.613	1.010
LIN •	39782	LINDANE (BHC, G)	0.051	0.619	0.964
MEXCLR •	39480	METHOXYCHLOR	0.057	1.160	1.260
PPDDD	39310	DDD,PP	0.019	0.581	1.170
PPDDE	39320	DDE,PP	0.025	0.675	0.999
PPDDT •	39300	DDT,PP	0.034	0.663	0.949
TXPHEN	39400	TOXAPHENE	1.350	11.60	1.000
ISODR •	39430	ISODRIN	0.056	1.1	0.910

CRL CERTIFIED REPORTING LIMIT IN (micrograms per liter)
UCR UPPER CERTIFIED RANGE IN (micrograms per liter)
SLOPE REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE
• CONTROL ANALYTES

Source: Hunter/ESE, 1990

Table 20 (Page 1 of 1)

UH02
PCBs IN WATER BY GCEC

SHORT NAME	STORET	LONG NAME		CRL	UCR	SLOPE
PCB016	34671	PCB 1016		0.16	6.4	0.826
PCB260	39508	PCB 1260		0.19	6.3	0.925
PCB221	39488	PCB 1221	NC	0.160		
PCB232	39492	PCB 1232	NC	0.160		
PCB242	39496	PCB 1242	NC	0.190		
PCB248	39500	PCB 1248	NC	0.190		
PCB254	39504	PCB 1254	NC	0.190		

CRL CERTIFIED REPORTING LIMIT IN (micrograms per liter)
UCR UPPER CERTIFIED RANGE IN (micrograms per liter)
SLOPE REPRESENTS AVERAGE ACCURACY OVER THE CERTIFIED RANGE
NC NON-CERTIFIED ANALYTES AND CRLs

Source: Hunter/ESE, 1990

Table 21 Miscellaneous Parameters in Water Samples

Short Name	Long Name	USATHAMA Method	CRL	UCR	Slope
CYN	Cyanide	TF18	2.5	50.0	1.00
PHENLC	Total Phenols	H2	7.12	50.0	0.878
SO4	Sulfate	TT10	10,000	300,000	1.00
CL	Chloride	TT10	2120	30,000	0.911
TDS	Total Dissolved Solids	NC*	10,000+	NA**	NA

*NC - not certified.
+This is the method detection limit.
CRL - certified reporting limit in micrograms per liter.
UCR - upper certified range in micrograms per liter.
Slope - average recovery over the certified range.
**NA - not applicable.

Source: Hunter/ESE, 1990.

Table 22 (Page 1 of 1)

UW14
NITROAROMATICS IN WATER BY HPLC

SHORT NAME	LONG NAME	CRL	UCR	SLOPE	CONTROL LIMITS MAA LCL	MAA UCL	MAP	ACCU LCL	ACCU UCL	PREC
HMX	CYCLOTETRAMETHYLENE TETRANITRAMINE	1.65	28.9	0.932						
RDX •	CYCLONITE	2.11	43.9	0.851	74.2	110.2	45.3	80.8	113.6	2[illegible]
135TNB •	1,3,5-TRINITROBENZENE	0.626	42.1	0.817	60.4	93.4	41.5	70.6	92.4	18.9
13DNB	1,3-DINITROBENZENE	0.519	40.1	0.832						
NB •	NITROBENZENE	1.07	54.9	0.795	63.3	98.5	44.3	66.8	97.7	2[illegible]3
TETRYL	NITRAMINE	0.556	44.5	0.749						
246TNT •	2,4,6-TRINITROTOLUENE	0.588	40.2	0.855	57.5	99.3	52.5	74.4	97.4	1[illegible]9
26DNT	2,6-DINITROTOLUENE	1.15	52.4	0.767						
24DNT •	2,4-DINITROTOLUENE	0.612	40.2	0.835	67.8	96.0	35.5	71.8	96.6	21.6

NOTE: ALL CONTROL LIMITS ARE SUBJECT TO CHANGE AS PER THE USATHAMA QA PL[illegible] CONTROL CHART PROTOCOL

•	THESE ELEMENTS ARE THE CONTROL SPIKES FOR THIS METHOD
CRL	CERTIFIED REPORTING LIMIT IN (micrograms per liter)
UCR	UPPER CERTIFIED RANGE IN (micrograms per liter)
MAA	MOVING AVERAGE ACCURACY (percent recovery)
LCL	LOWER CONTROL LIMIT OF THE ACCURACY
UCL	UPPER CONTROL LIMIT OF THE ACCURACY
MAP	MOVING AVERAGE PRECISION
PREC	PRECISION OF THE REPLICATE HIGH SPIKES
ACCU	ACCURACY OF THE REPLICATE HIGH SPIKES

Source: Hunter/ESE, 1990

Appendix N

Quality Control Results

JMM James M. Montgomery
Consulting Engineers Inc.

TABLE N-1

FIELD DUPLICATE RESULTS FOR SOIL SAMPLES

	Control Limit	TNT-05-SS			CCB-02-SB			CCB-02-SB			CCB-03-SB		
	RPD	Original	Dup.	RPD(%)	Orig.	Dup	RPD(%)	Orig.	Dup	RPD(%)	Orig.	Dup	RPD(%)
Depth (ft.):	(%)	0.5	0.5		20	20		80	80		35	35	
		ug/g	ug/g		ug/g	ug/g		ug/g	ug/g		ug/g	ug/g	
Moisture (%)	25	8.7	9.8	12	3.0	3.1	3.0	4.1	18.2	126*	15.6	12.1	25
Arsenic	25	4.21	6.04	35.7*	4.90	4.83	1.44	3.61	5.1	34*	2.91	2.00	37.0*
Barium	25	218	208	4.69									
Lead	25	9.11	<6.62	NC				6.67	<6.62	NC			
Vanadium	25	33.6	25.1	29.0*									
Zinc	25				<30.2	56.7	NC	74.7	110	38*			
Ignitability (deg. C	--	>100	50	NC									
1,3,5-TNB	28	42.6	40.6	4.81									
2,4,6-TNT	28	9830	6500	40.8*									
Total Phenols	20				0.1	<0.10	NC	0.16	<0.12	NC			

	Control Limit	CCB-04-SB			CCB-04-SB			CCB-05-SB			ALF-02-SB		
	RPD	Original	Dup.	RPD(%)	Orig.	Dup	RPD(%)	Orig.	Dup	RPD(%)	Orig.	Dup	RPD(%)
Depth (ft.)	(%)	5	5		50	50		30	30		50	50	
		ug/g	ug/g		ug/g	ug/g		ug/g	ug/g		ug/g	ug/g	
Moisture (%)	25	2.5	1.7	38*	4.6	4.8	4.26	15.0	11.1	29.9*	4.1	4.9	18
Arsenic	25	10.2	13.4	27.1*	2.22	2.08	6.51	15.6	16.2	3.77	2.54	1.60	45.4*
Lead	25										11.6	<6.62	NC
Zinc	25							72.7	67	8.16			
Total Phenols	20							<0.10	0.27	NC			

	Control Limit	ALF-03-SB			ALF-04-SB			DMO-06-SB			DMO-07-SB		
	RPD	Original	Dup.	RPD (%)	Orig.	Dup	RPD(%)	Orig.	Dup	RPD(%)	Orig.	Dup	RPD(%)
Depth (ft.)	(%)	50	50		50	50		50	50		50	50	
		ug/g	ug/g		ug/g	ug/g		ug/g	ug/g		ug/g	ug/g	
Moisture (%)	25	3.0	2.9	3.4	9.7	7.0	32*	12.5	12.7	1.59	14.7	13.4	9.25
Arsenic	25	1.28	0.769	49.9*	2.66	1.42	60.8*	4.24	6.93	48.2*	3.71	6.24	50.8
Barium	25							207	218	5.18	265	233	12.8
Molybdenum	25							<1.15	6.07	NC	2.53	2.32	8.66
Vanadium	25							87.9	84.6	3.83	75.0	76.5	1.98
Zinc	25							73.5	79.2	7.47	85.4	88.8	3.90
Toluene	21	<0.0008	0.001	NC									

TABLE N-1
(continued)
FIELD DUPLICATE RESULTS FOR SOIL SAMPLES

	Control Limit	DNO-07-SB			DNO-09-SB			DNO-10-SB			DNO-10-SB		
Depth (ft.)	RPD (%)	Original 90 ug/g	Dup. 90 ug/g	RPD(%)	Orig. 50 ug/g	Dup 50 ug/g	RPD(%)	Orig. 50 ug/g	Dup 50 ug/g	RPD(%)	Orig. 80 ug/g	Dup 80 ug/g	RPD(%)
Moisture (%)	25	10.7	7.2	39*	9.7	11.4	16.1	9.1	9.1	0.00	6.1	5.7	6.8
Arsenic	25	14.4	4.36	107*	7.50	7.45	0.67	3.99	3.51	12.8	4.37	4.22	3.49
Barium	25	138	172	21.9	182	100	58.2*	207	167	21.4	95.6	153	46.2*
Lead	25	65	<6.62	NC	7.32	<6.62	NC						
Molybednum	25				2.31	<1.15	NC						
Vanadium	25	48.8	60.9	22.1	35.0	33.4	4.68	55.5	51.1	8.26	47.1	55.8	16.9
Zinc	25	61.6	65	5.37				59.1	<30.2	NC	<30.2	58.5	NC

	Control Limit	DNO-11-SB			DNO-12-SB			DNO-13-SB			TNT-07-SB		
Depth (ft)	RPD (%)	Original 45 ug/g	Dup. 45 ug/g	RPD(%)	Orig. 20 ug/g	Dup 20 ug/g	RPD(%)	Orig. 50 ug/g	Dup 50 ug/g	RPD(%)	Orig. 40 ug/g	Dup 40 ug/g	RPD(%)
Moisture (%)	25	11.1	11.0	0.90	3.9	4.9	23	10	8.7	14	3.6	4.3	18
Arsenic	25	3.20	2.60	20.7	6.15	4.65	27.8*	3.48	3.24	7.14			
Barium	25	204	253	21.4	111	53.4	70.1*	120	123	2.47			
Molybdenum	25				2.73	<1.15	NC						
Vanadium	25	54.3	63.4	15.5	35.4	22.5	44.6*	28.6	44.4	43.3*			
Zinc	25	68.9	79.0	13.66									

	Control Limit	TNT-08-SB			TNT-09-SB			TNT-10-SB			TNT-11-SB		
Depth (ft.)	RPD (%)	Original 35 ug/g	Dup. 35 ug/g	RPD(%)	Orig. 35 ug/g	Dup 35 ug/g	RPD(%)	Orig. 35 ug/g	Dup 35 ug/g	RPD(%)	Orig. 35 ug/g	Dup 35 ug/g	RPD(%)
Moisture (%)	25	4.8	4.0	18.2	10.6	11.5	8.14	12.5	14.5	14.8	12.6	8.8	36*
Arsenic	25	3.23	3.25	0.62	5.07	6.64	26.8	6.70	6.55	2.26	4.18	3.56	16.0
Zinc	25				64.7	<30.2	NC	86.4	<30.2	NC			

TABLE N-1
(concluded)
FIELD DUPLICATE RESULTS FOR SOIL SAMPLES

	Control Limit	TNT-12-SB			TNT-13-SB			TNT-14-SB			TNT-15-SB		
Depth (ft.)	RPD (%)	Original 40 ug/g	Dup. 40 ug/g	RPD(%)	Orig. 40 ug/g	Dup 40 ug/g	RPD(%)	Orig. 40 ug/g	Dup 40 ug/g	RPD(%)	Orig. 40 ug/g	Dup 40 ug/g	RPD(%)
Moisture (%)	25	10.8	10.9	0.92	19.1	17.5	8.74	14.6	13.1	10.8	14.5	15.7	7.95
Arsenic	25	4.22	2.85	38*	3.55	3.14	12.3	1.92	3.33	53.7*	5.42	4.57	17.0
Chromium	25										<12.7	25.2	NC
Nickel	25							<12.6	27	NC			
Zinc	25				<30.2	85.3	NC	75.2	85.2	12.5	86.3	99.2	13.9
2,4-DNT	28				0.5	0.613	20.3						
HMX	28				0.922	0.922	0.00				0.852	0.94	9.82
RDX	39	1.98	1.27	43.7*	8.45	8.72	3.15	1.41	3.43	83.5*	5.06	6.64	27.0
1,3,5-TNB	28	1.33	0.837	45.5*	10.2	11.2	9.35	<0.488	3.74	NC	14.7	14.5	1.37
2,4,6-TNT	28				1.72	1.12	42.2				0.621	0.658	5.79
TCE	24	0.004	<0.003	NC									

	Control Limit	TNT-16-SB			TNT-17-SB			TNT-18-SB			TNT-19-SB		
Depth (ft)	RPD (%)	Original 25 ug/g	Dup. 25 ug/g	RPD(%)	Orig. 25 ug/g	Dup 25 ug/g	RPD(%)	Orig. 25 ug/g	Dup 25 ug/g	RPD(%)	Orig. 25 ug/g	Dup 25 ug/g	RPD(%)
Moisture (%)	25	4.3	4.3	0.00	9.6	8.8	8.70	5.2	5.7	9.2	3.3	5.6	52.7*
Arsenic	25	7.96	9.41	16.7	4.4	4.64	5.31	8.53	10.8	23.5	6.72	6.2	8.05
Zinc	25				<30.2	58.3	NC						
RDX	39	0.712	<0.587	NC									
1,3,5-TNB	28	7.26	7.06	2.79	11.2	8.61	26.2	7.47	7.05	5.79	5.17	4.07	23.8
2,4-DNT	28							0.728	0.456	46.0*			
2,4,6-DNT	28							0.722	0.477	40.9*			

RPD: Relative percent difference
NC: Not calculated
"<": Compound was not detected above listed detection limit
"*": RPD is greater than the control limit

TABLE N-2

FIELD DUPLICATE RESULTS FOR
ROUND I GROUNDWATER SAMPLES

PARAMETER	RPD Limit (%)	ALF-03-MWA Orig. ug/L	ALF-03-MWA Dup ug/L	ALF-03-MWA RPD (%)	DMO-05-MWA Orig. ug/L	DMO-05-MWA Dup ug/L	DMO-05-MWA RPD (%)	PSW-02 Orig. ug/L	PSW-02 Dup ug/L	PSW-02 RPD (%)
INORGANICS										
ARSENIC	25	3.94	4.80	19.7	4.8	4.58	4.69	5.97	5.97	0.00
BARIUM	25	53.5	54.7	2.22	28.9	21.3	30.2*	28.4	22.4	23.6
CADMIUM	25									
CHROMIUM	25									
COPPER	25				11.5	<8.09	NC			
LEAD	25							3.6	2.8	25.00
MERCURY	25									
SELENIUM	25	14.9	15.3	2.65	11.6	11.8	1.71			
ZINC	25	47.2	43.1	9.08	72.1	<21.1	NC	61.6	61.7	0.16
CALCIUM (ug/L-CA)	25	192000	188000	2.11	96800	95300	1.56	104000	102000	1.94
SODIUM (ug/L-NA)	25	49200	48700	1.02	71300	64300	10.3	87000	11300	154*
RESIDUE,DISS	25	1250	1300	3.92	826	840	1.68	850	680	22.2
CHLORIDE	25	NA	267000	NC	63100	59100	6.55	59800	57900	3.23
SULFATE	25	NA	265000	NC	323000	326000	0.92	378000	371000	1.87
VOLATILE ORGANIC COMPOUNDS										
CARBON TETRACHLORIDE (a)	---	<0.250	0.288	NC						
CHLOROFORM	30	1.1	1.1	0.00						
TRICHLOROETHENE	30				19.6	26.0	28.1			
EXTRACTABLE ORGANIC COMPOUNDS										
BIS(2-ETHYLHEXYL) PHTHALATE	30				<4.8	4.6	NC			

(a): Results based on semi-quantitative GC analysis. All other VOC results based on GC/MS analysis.
"*": Indicates result is greater than control limit.
NC: Not calculated.
NA: Not available.

TABLE N-2
(concluded)
FIELD DUPLICATE RESULTS FOR
ROUND I GROUNDWATER SAMPLES

FIELD ID	RPD Limit (%)	TNT-01-MWA Orig. ug/L	TNT-01-MWA Dup ug/L	TNT-01-MWA RPD (%)	TNT-10-MWA Orig. ug/L	TNT-10-MWA Dup ug/L	TNT-10-MWA RPD (%)
INORGANICS							
ARSENIC	25	17.0	18.2	6.82	12.0	11.5	4.26
BARIUM	25	19.2	21.5	11.3	47.1	46.7	0.85
CADMIUM	25						
CHROMIUM	25				226	224	0.89
COPPER	25						
LEAD	25	<1.3	2.1	NC	2.5	<1.3	NC
MERCURY	25				0.3	<0.2	NC
SELENIUM	25						
ZINC	25						
CALCIUM (ug/L-CA)	25	16600	17100	2.97	58400	60600	3.70
SODIUM (ug/L-NA)	25	191000	228000	17.7	267000	271000	1.49
RESIDUE,DISS	25	864	856	0.93	1050	994	5.48
CHLORIDE	25	47400	53000	11.2	87900	85500	2.77
SULFATE	25	186000	198000	6.25	190000	189000	0.53
VOLATILE ORGANIC COMPOUNDS							
CARBON TETRACHLORIDE (a)	---						
CHLOROFORM	30						
TRICHLOROETHENE	30						
EXTRACTABLE ORGANIC COMPOUNDS							
BIS(2-ETHYLHEXYL) PHTHALATE	30						

(a): Results based on semi-quantitative GC analysis. All other VOC results based on GC/MS analysis.
***: Indicates result is greater than control limit.
NC: Not calculated.
NA: Not available.

TABLE N-3

SURROGATE RECOVERIES OUTSIDE CONTROL LIMITS FOR SOIL SAMPLES

Sample ID	Depth ft.	Method	Compound	Recovery %	Control Limits %
ALF-02-SB-MS	40	VOA	Toluene-d8	120	81-117
ALF-03-SB	5	VOA	Toluene-d8	120	81-117
ALF-03-SB	20	VOA	Toluene-d8	120	81-117
ALF-03-SB	25	VOA	Toluene-d8	120	81-117
ALF-03-SB	30	VOA	Toluene-d8	120	81-117
ALF-03-SB	35	VOA	4-Bromofluorobenzene	122	74 - 121
" "		VOA	Toluene-d8	120	81-117
ALF-03-SB-DUP	50	SV	2-Fluorobiphenyl	120	30 - 115
ALF-03-SB-MS	25	VOA	Toluene-d8	120	81-117
ALF-04-SB	70	VOA	Toluene-d8	80	81-117
CCB-01-SB	40	VOA	Toluene-d8	80	81-117
CCB-03-SB	88	VOA	Toluene-d8	80	81-117
CCB-04-SB	30	VOA	Toluene-d8	120	81-117
CCB-04-SB-MS	45	VOA	Toluene-d8	80	81-117
DMO-06-SB	90	VOA	Toluene-d8	80	81-117
DMO-07-SBDUP	50	VOA	Toluene-d8	120	81-117
DMO-08-SB	30	VOA	Toluene-d8	80	81-117
DMO-08-SB	35	VOA	Toluene-d8	80	81-117
DMO-08-SB-MS	35	VOA	Toluene-d8	80	81-117
DMO-08-SB	45	VOA	Toluene-d8	80	81-117
DMO-08-SB	50	VOA	Toluene-d8	80	81-117
DMO-08-SB	60	VOA	Toluene-d8	80	81-117
DMO-08-SB	70	VOA	Toluene-d8	80	81-117
DMO-08-SB	80	VOA	Toluene-d8	80	81-117
DMO-09-SB-MS	10	VOA	Toluene-d8	120	81-117
DMO-11-SB	15	SV	2,4,6-Tribromophenol	0	19 -122
" "		SV	2-Fluorobiphenyl	0	30 -115
" "		SV	2-Fluorophenol	0	25 - 121
" "		SV	Terphenyl-d14	0	18 - 137
" "		SV	Nitrobenzene-d5	0	23 - 120
" "		SV	Phenol-d5	0	24 - 113
" "		VOA	Toluene-d8	140	81-117
DMO-12-SB	15	SV	2,4,6-Tribromophenol	160	19 - 122
DMO-12-SB-MS	5	SV	2,4,6-Tribromophenol	150	19 - 122
" "		SV	2-Fluorobiphenyl	120	30 - 115
DMO-13-SB	50	VOA	Toluene-d8	120	81-117
DMO-13-SB	70	VOA	Toluene-d8	120	81-117
DMO-13-SBDUP	70	VOA	Toluene-d8	120	81-117
TNT-15-SB	5	VOA	Toluene-d8	120	81-117
TNT-19-SB	35	VOA	Toluene-d8	80	81-117

VOA: Volatile organic analysis, Method LM19
SV: Semivolatile organic analysis, Method LM18

TABLE N-4

SURROGATE RECOVERIES OUTSIDE CONTROL LIMITS
FOR ROUND 1 GROUNDWATER SAMPLES

Sample ID	Method	Compound	Recovery %	Control Limits
ALF-01-MWA	VOA	Toluene-d8	86	88 - 110
ALF-01-MWA-MS	VOA	4-Bromofluorobenzene	82	86 - 115
ALF-03-MWA	VOA	4-Bromofluorobenzene	84	86 - 115
ALF-03-MWA-MS	VOA	4-Bromofluorobenzene	82	86 - 115
DMO-05-MWA	VOA	4-Bromofluorobenzene	84	86 - 115
PSW-02	SV	2,4,6-Tribromophenol	0.99	10 - 123
" "	SV	2-Fluorophenol	0.25	21 - 100
" "	SV	Phenol-d5	0.17	10 - 94
PSW-02-MS	SV	2-Fluorophenol	1.9	21 - 100
" "	SV	Phenol-d5	1.9	10 - 94
PSW-02-MSD	SV	2,4,6-Tribromophenol	6.7	10 - 123
" "	SV	2-Fluorophenol	1.3	21 - 100
" "	SV	Phenol-d5	1.4	10 - 94
PSW-02DUP	SV	2,4,6-Tribromophenol	1.1	10 - 123
" "	SV	2-Fluorophenol	0	21 - 100
" "	SV	Phenol-d5	0	10 - 94
PSW-08	SV	2,4,6-Tribromophenol	0	10 - 123
" "	SV	2-Fluorophenol	0	21 - 100
" "	SV	Phenol-d5	0.14	10 - 94
PSW-09-MS	VOA	Toluene-d8	78	88 - 110
TNT-01-MWADUP	SV	2,4,6-Tribromophenol	130	10 - 123
" "	VOA	4-Bromofluorobenzene	82	86 - 115
" "	VOA	Toluene-d8	86	88 - 110
TNT-02-MWA	VOA	4-Bromofluorobenzene	120	86 - 115
TNT-03-MWA	VOA	Toluene-d8	80	88 - 110
TNT-04-MWA	VOA	Toluene-d8	80	88 - 110
TNT-05-MWA-MS	VOA	Toluene-d8	84	88 - 110
TNT-06-MWA-MS	SV	2,4,6-Tribromophenol	140	10 - 123
TNT-07-MWA	VOA	Toluene-d8	80	88 - 110
TNT-07-MWC	VOA	Toluene-d8	82	88 - 110
TNT-09-MWA	VOA	Toluene-d8	82	88 - 110
TNT-10-MWB	VOA	Toluene-d8	82	88 - 110
TNT-10-MWC	VOA	Toluene-d8	82	88 - 110
TNT-13-MWA	VOA	Toluene-d8	80	88 - 110

TABLE N-4
(concluded)
SURROGATE RECOVERIES OUTSIDE CONTROL LIMITS FOR ROUND 1 GROUNDWATER SAMPLES

Sample ID	Method	Compound	Recovery %	Control Limits
TNT-14-MWA	VOA	Toluene-d8	84	88 - 110
TNT-15-MWA	VOA	Toluene-d8	86	88 - 110
TNT-16-MWA	VOA	Toluene-d8	82	88 - 110
TNT-GW-RB	VOA	Toluene-d8	84	88 - 110
GW-TB, 4/17	VOA	Toluene-d8	86	88 - 110
GW-TB, 4/18	VOA	4-Bromofluorobenzene	84	86 - 115
GW-TB, 4/24	VOA	Toluene-d8	86	88 - 110
GW-TB, 4/25a	VOA	Toluene-d8	80	88 - 110
GW-TB, 4/25b	VOA	Toluene-d8	84	88 - 110
GW-TB, 5/2a	VOA	Toluene-d8	84	88 - 110
GW-TB, 5/2b	VOA	Toluene-d8	84	88 - 110
GW-TB, 5/1	VOA	Toluene-d8	82	88 - 110

VOA: Volatile organic analysis, Method UM20
SV: Semivolatile organic analysis, Method UM18
GW-TB: Groundwater trip blank, followed by the day sample was shipped.

TABLE N-5

SUMMARY OF SOIL MATRIX SPIKE RESULTS

Method	Compound	Control Limit %	Total No. Spiked Results	No. Spikes Outside Limits	% of Spikes Outside Limits
Semivolatile Organic Compounds					
(LM18)	Phenol	26 - 90	34	11	32
	2-Chlorophenol	25 - 102	34	3	8.8
	1,4-Dichlorobenzene	28 - 104	34	1	2.9
	N-Nitroso-di-n-propylamine	41 - 126	34	0	0
	1,2,4-Trichlorobenzene	38 - 107	34	0	0
	4-Chloro-3-methylphenol	26 - 103	34	6	18
	Acenaphthene	31 - 137	34	0	0
	4-Nitrophenol	11 - 114	34	1	2.9
	2,4-DNT	28 - 89	34	13	38
	Pentachlorophenol	17 - 109	34	14	41
	Pyrene	35 - 142	34	0	0
Volatile Organic Compounds					
(LM19)	1,1-Dichloroethene	59 - 172	36	0	0
	Trichloroethene	62 - 137	36	0	0
	Benzene	66 - 142	36	0	0
	Toluene	59 - 139	36	0	0
	Chlorobenzene	60 - 133	36	0	0
Metals					
(JD19)	Arsenic	75 - 125	50	7	14
(JD15)	Selenium	75 - 125	50	50	100
(JB01)	Mercury	75 - 125	50	0	0
(JS11)	Silver	75 - 125	45	5	11
	Beryllium	75 - 125	45	0	0
	Cadmium	75 - 125	45	0	0
	Copper	75 - 125	45	0	0
	Nickel	75 - 125	45	0	0
	Thallium	75 - 125	45	6	13
	Zinc	75 - 125	45	2	4.4

TABLE N-5
(concluded)

SUMMARY OF SOIL MATRIX SPIKE RESULTS

Method	Compound	Control Limit %	Total No. Spiked Results	No. Spikes Outside Limits	% of Spikes Outside Limits
Pesticides					
(LH10)	BHC, G	46 - 127	31	3	9.7
	Heptachlor	35 - 110	31	3	9.7
	Aldrin	34 - 132	31	1	3.2
	Dieldrin	31 - 134	31	2	6.4
	Endrin	42 - 139	31	1	3.2
	DDT,PP	23 - 134	31	4	13
PCBs					
(LH16)	PCB 1016	50 - 114	33	3	9.1
	PCB 1260	8 - 127	33	5	15
Explosives					
(LW12)	2,4-DNT	83 - 106 (1)	19	5	26
	RDX	68 - 100 (1)	19	1	5.2
	1,3,5-TNB	73 - 96 (1)	19	9	47
Misc. Method					
I	Chromium +6	60 - 140	5	0	0
KY01	Cyanide	70 - 120	18	0	0
I	Total Phenols	75 - 125	15	0	0

(1) General Limits

TABLE N-6

MATRIX SPIKE RESULTS OUTSIDE
CONTROL LIMITS FOR ROUND 1
GROUNDWATER SAMPLES

Sample ID	Method	Compound	Control Limit %	Recovery %
DMO-03-MWA (a)	SD21	Selenium	75-125	74.0
	SD22	Arsenic	75-125	54.5
	SD23	Silver	75-125	54.4
	SD23	Silver	75-125	59.9
DMO-04-MWA (a)	SD21	Selenium	75-125	36.7
	SD22	Arsenic	75-125	35.2
	SD23	Silver	75-125	61.3
	SD23	Silver	75-125	56.9
	SS10	Calcium	75-125	63.6
	SS10	Sodium	75-125	60.5
	UM18	4-Chloro-3-methylphenol	23 - 97	110
	UM18	Pentachlorophenol	9 - 103	110
PSW-02 (a)	SS10	Calcium	75-125	126
	SS10	Sodium	75-125	144
	UM18	1,2,4-Trichlorobenzene	39 - 98	100
	UM18	2,4-Dinitrotoluene	24 - 96	100
	UM18	4-Chloro-3-methylphenol	23 - 97	3.8
	UM18	4-Chloro-3-methylphenol	23 - 97	2.7
	UM18	4-Nitrophenol	10 - 80	90
	UM18	4-Nitrophenol	10 - 80	81
	UM18	Phenol	12 - 89	1.7
	UM18	Phenol	12 - 89	1.2
PSW-02DUP	UH13	Aldrin	40 - 120	133
	UH13	BHC, G	56 - 123	130
TNT-01-MWC	UM18	2,4-Dinitrotoluene	24 - 96	110
TNT-02-MWC	UM18	1,2,4-Trichlorobenzene	39 - 98	99.0
	UM18	2,4-Dinitrotoluene	24 - 96	120
	UM18	Pentachlorophenol	9 - 103	130
	UM18	Pyrene	26 - 127	130
TNT-06-MWA	UM18	1,2,4-Trichlorobenzene	39 - 98	110
	UM18	2,4-Dinitrotoluene	24 - 96	98.0
	UM18	4-Chloro-3-methylphenol	23 - 97	110
	UM18	Pentachlorophenol	9 - 103	150
	UM18	Pyrene	26 - 127	130
DMO-GW-RB	UH13	Endrin	56 - 121	2.68
RB-2	UM18	2,4-Dinitrotoluene	24 - 96	98.0

(a) Two separate matrix spikes were prepared and analyzed for some methods.

TABLE N-7

SUMMARY OF POSITIVE SOIL METHOD BLANK RESULTS

Lot No.	Method	Compound	Method Blank ug/g	CRL ug/g
Pesticides				
PPT	LH10	Aldrin	0.0008	<0.007
PPL	LH10	BHC,A	0.0033	<0.009
PPK	LH10	BHC,G	0.0002	<0.006
PPT	LH10	BHC,G	0.0001	<0.006
PPU	LH10	Chlordane	0.0002	<0.018
PPH	LH10	DDT, PP	0.0001	<0.007
PPH	LH10	Dieldrin	0.00006	<0.006
PPT	LH10	Dieldrin	0.0003	<0.006
PPK	LH10	EndosulfanA	0.0004	<0.006
PPT	LH10	EndosulfanA	0.0004	<0.006
PPH	LH10	EndosulfanB	0.00009	<0.007
PPH	LH10	Endrin	0.0004	<0.007
PPT	LH10	Endrin	0.0002	<0.007
PPI	LH10	Heptachlor	0.008	<0.006
PPK	LH10	Heptachlor	0.009	<0.006
PPT	LH10	Heptachlor	0.005	<0.006
PPK	LH10	Isodrin	0.00007	<0.005
PPT	LH10	Isodrin	0.001	<0.005
PPH	LH10	Methlxychlor	0.003	<0.071
Volatile Compounds				
PNW	LM19	Acetone	0.01	<0.02
PNY	LM19	Acetone	0.006	<0.02
PNZ	LM19	Acetone	0.006	<0.02
RZG	LM19	Acetone	0.009	<0.02
RZH	LM19	Acetone	0.01	<0.02
RZK	LM19	Acetone	0.008	<0.02
RZL	LM19	Acetone	0.02	<0.02
RZM	LM19	Acetone	0.007	<0.02
RZK	LM19	Acrylonitrile	0.03	<0.1
RZL	LM19	Acrylonitrile	0.002	<0.1
RZL	LM19	Benzene	0.0002	<0.002
RZV	LM19	Methylene chloride	0.005	<0.012
PNW	LM19	Methylene chloride	0.002	<0.012
PNY	LM19	Methylene chloride	0.003	<0.012

TABLE N-7

SUMMARY OF POSITIVE
SOIL METHOD BLANK RESULTS

	Lot No.	Method	Compound	Method Blank ug/g	CRL ug/g
	RNY	LM19	Methylene chloride	0.003	<0.012
	RZG	LM19	Methylene chloride	0.001	<0.012
	RZH	LM19	Methylene chloride	0.002	<0.012
	RZL	LM19	Methylene chloride	0.001	<0.012
	RZV	LM19	Toluene	0.0007	<0.0008
	PNX	LM19	Toluene	0.0009	<0.0008
	PNY	LM19	Toluene	0.0005	<0.0008
	PNZ	LM19	Toluene	0.001	<0.0008
	RZG	LM19	Toluene	0.0005	<0.0008
	RZL	LM19	Toluene	0.0009	<0.0008
	RZB	LM19	Trichlorofluoromethane	0.01	<0.006
	RZC	LM19	Trichlorofluoromethane	0.009	<0.006
	RZD	LM19	Trichlorofluoromethane	0.01	<0.006
	RZE	LM19	Trichlorofluoromethane	0.009	<0.006
	RZF	LM19	Trichlorofluoromethane	0.01	<0.006
	RZG	LM19	Trichlorofluoromethane	0.02	<0.006
	RZK	LM19	Trichlorofluoromethane	0.02	<0.006
	RZL	LM19	Trichlorofluoromethane	0.02	<0.006
	RZM	LM19	Trichlorofluoromethane	0.02	<0.006
Explosives					
	RPO	LW12	2,4,6-TNT	0.316	<0.456
	RPP	LW12	2,4,6-TNT	0.187	<0.456
	RPR	LW12	2,4,6-TNT	0.125	<0.456
	RPP	LW12	HMX	0.111	<0.424
	RPR	LW12	HMX	0.227	<0.424
	RPN	LW12	RDX	0.255	<0.587

CRL: Certified Reporting Limit

TABLE N-8

SUMMARY OF POSITIVE ROUND 1
GROUNDWATER METHOD BLANK RESULTS

	Lot No.	Method	Compound	Method Blank ug/L	CRL ug/L
	RCE	H2	Total Phenols	0.3	<7.1
Inorganic Analytes					
	RYW	I	Disolved Residue	0.5	<5
	RUH	SS10	Calcium	478	<21.1
	RUH	SS10	Chromium	2.29	<6.02
	RUH	SS10	Copper	2.44	<8.09
	RUH	SS10	Sodium	93.4	<21.1
	RUH	SS10	Zinc	18.6	<21.1
Pesticides					
	OEL	UH13	BHC,A	0.004	<0.039
	OEL	UH13	BHC,D	0.003	<0.029
	OEL	UH13	BHS,B	0.003	<0.024
	OEL	UH13	DDD,PP	0.002	<0.023
	OEL	UH13	DDE,PP	0.002	<0.027
	OEL	UH13	Isodrin	0.002	<0.056
	OEL	UH13	Lindane	0.004	<0.051
Semivolatile Compounds					
	SAL	UM18	Bis(2-Ethylhexyl)-phthalate	6.3	<4.8
	SAN	UM18	Bis(2-Ethylhexyl)-phthalate	16	<4.8
	RQO	UM20	1,1,2-Trichloroethane	0.31	<1.2
Volatile Compounds					
	RQS	UM20	Benzene	0.03	<0.50
	RQO	UM20	Chlorobenzene	0.05	<0.50
	RQO	UM20	Dibromochloromethane	0.13	<0.67
	RQO	UM20	Ethylbenzene	0.06	<0.50
	RQO	UM20	Toluene	0.23	<0.50
	RQO	UM20	Trichlorofluoromethane	0.15	<1.4
	RQP	UM20	Trichlorofluoromethane	0.40	<1.4
Explosives					
	SCC	UW14	1,3,5-TNB	0.154	<0.626
	SCE	UW14	1,3,5-TNB	0.135	<0.626
	SCK	UW14	1,3,5-TNB	0.118	<0.626
	SCL	UW14	1,3,5-TNB	0.119	<0.626
	SCC	UW14	2,4,6-TNT	0.122	<0.588
	SCE	UW14	2,4,6-TNT	0.140	<0.588

TABLE N-8
(concluded)
SUMMARY OF POSITIVE ROUND 1
GROUNDWATER METHOD BLANK RESULTS

Lot No.	Method	Compound	Method Blank ug/L	CRL ug/L
SCK	UW14	2,4,6-TNT	0.089	<0.588
SCC	UW14	2,4-Dinitrotoluene	0.203	<0.612
SCE	UW14	2,4-Dinitrotoluene	0.280	<0.612
SCL	UW14	2,4-Dinitrotoluene	0.169	<0.612
SCC	UW14	2,6-Dinitrotoluene	0.146	<1.15
SCC	UW14	HMX	0.472	<1.65
SCE	UW14	HMX	0.279	<1.65
SCK	UW14	HMX	0.187	<1.65
SCL	UW14	HMX	0.210	<1.65
SCC	UW14	RDX	0.242	<2.11
SCE	UW14	RDX	0.169	<2.11
SCK	UW14	RDX	0.232	<2.11
SCL	UW14	RDX	0.011	<2.11
SCE	UW14	Tetryl	0.2	<0.6
SCL	UW14	Tetryl	0.2	<0.6

TABLE N-9

ROUND 1 GROUNDWATER TRIP BLANK RESULTS

FIELD ID	GW-TB	GW-TB	GW-TB	GW-TB	GW-TB	GW-TB	GW-TB	GW-TB	GW-TB	GW-TB
LAB ID	SIADW1*54	SIADW1*55	SIADW1*56	SIADW1*57	SIADW1*58	SIADW1*59	SIADW1*60	SIADW1*61	SIADW1*62	SIADW1*63
COLLECTION DATE	4/16/90	4/17/90	4/18/90	4/19/90	4/20/90	4/23/90	4/24/90	4/25/90	4/25/90	4/30/90
PARAMETER NAME	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
VOLATILE ORGANIC COMPOUNDS										
TRANS-1,3-DICHLOROPROPENE (a)	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250
CARBON TETRACHLORIDE (a)	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250
TOLUENE (b)	<0.50	<0.50	<0.50	<0.50	0.96	<0.50	<0.50	<0.50	<0.50	<0.50

(a) Results based on semi-quantitative GC analysis.
(b) Results based on GC/MS analysis.

TABLE N-9
(concluded)
ROUND 1 GROUNDWATER TRIP BLANK RESULTS

FIELD ID	GW-TB	GW-TB	GW-TB	GW-TB	GW-TB	GW-TB
LAB ID	SIADW1*64	SIADW1*65	SIADW1*66	SIADW1*67	SIADW1*71	SIADW1*72
COLLECTION DATE	5/1/90	5/2/90	5/2/90	5/4/90	5/7/90	5/7/90
COLLECTION TIME				0:00		
DEPTH (FEET)	0	0	0	0	0	0
PARAMETER NAME	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
VOLATILE ORGANIC COMPOUNDS						
TRANS-1,3-DICHLOROPROPENE (a)	<0.250	<0.250	<0.250	<0.250	0.363	<0.250
CARBON TETRACHLORIDE(a)	<0.250	<0.250	<0.250	<0.250	0.25	<0.250
TOLUENE (b)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

(a) Results based on semi-quantitative GC analysis.
(b) Results based on GC/MS analysis.

TABLE N-10

ROUND 1 GROUNDWATER
FILTER BLANK RESULTS

Field ID	FILTER BLK	FILTER BLK	FILTER BLK
Lab ID	SIADW1*24	SIADW1*25	SIADW1*26
Collection Date	4/24/90	4/30/90	5/2/90
Collection Time	15:40	11:00	16:00
Depth (feet)	0	0	0
Parameter Name	ug/L	ug/L	ug/L
INORGANICS			
Copper	8.56	<8.09	<8.09
Calcium (ug/L-CA)	536	629	577
Sodium (ug/L-NA)	1940	<500	<500

Appendix O

Contaminant Fate and Transport Model

JMM James M. Montgomery
Consulting Engineers Inc.

APPENDIX O
CONTAMINANT FATE AND TRANSPORT MODEL

O.1 Introduction

Saturated and unsaturated zone contaminant transport models were run by using data from the TNT Leaching Beds Area. Indicator contaminants were 1,3,5-trinitrobenzene (TNB) and TCE.

Vadose and saturated zone modeling was performed on 1,3,5-TNB from the TNT Leaching Beds subsite. It was selected as an indicator compound because it is the most mobile explosive compound detected and had the highest frequency of occurrence in the vadose and saturated zones. Therefore, 1,3,5-TBN represents the most conservative estimate of the lateral and vertical extent of the total explosives plume in the TNT Leaching Beds Area.

Saturated zone modeling was performed on TCE from the Vehicle Maintenance Area Subsite. This compound was chosen to model because it had the highest concentration and frequency of occurrence of the VOCs found at this site. TCE vadose zone modeling was not performed because of the absence of data. Five soil borings were installed in the Vehicle Maintenance Area Subsite. Borings placement was based on the distribution of TCE in soil gas at this site. However, TCE was not detected ion any of the soil samples and therefore could not be modeled.

Vadose and saturated zone modeling could not be performed at that Abandoned Landfill, Chemical Burial Site, Construction Debris Landfill, and DRMO Trench Area due to the insufficient data from these sites.

O.2 Routes of Migration

The pathways for exposure from potential contaminant migration are:

1. Surface exposure/dermal contact and ingestion
2. Atmospheric transport/wind-blow fugitive dust and volatilization
3. Surface runoff/dissolved contaminants and particulate transport/dermal contact and ingestion
4. Unsaturated-zone transport with subsequent saturated zone transport
5. Saturated zone transport to domestic and irrigation wells/dermal contact and ingestion

Additionally, some of the contaminants present in surface soils may be subject to degradation (biological or chemical transformation) or by biotic uptake. In order to provide a conservative estimate of potential contaminant migration, the quantitative analytical modeling did not factor in degradation processes that could occur in the saturated and unsaturated zones, and therefore, the concentrations calculated would be conservative. Lower concentrations would be expected if degradation processes were taken into account.

O.3 Model Objectives

Models were used to simulate solute transport in the unsaturated and saturated zones at the TNT Leaching Beds Area at SIAD. These processes are modeled because they are the primary exposure pathways (Section O.2), along with direct ingestion/inhalation or dermal contact with surface soils at the site. The model objectives are five-fold:

1. Simulation of current conditions;
2. Sensitivity analyses;
3. Simulation of future conditions;
4. Guide Phase II field work;
5. Risk assessment.

The solute transport modeling integrates the five objectives. Simulation of current conditions allows for the verification that the model can successfully forecast present values using an estimate of contaminant release and reasonable parameter values (although the mechanisms of solute transport and fate may not be represented exactly). Reasonable parameter values are those expected to fall within a given range based on chemical and hydrogeochemical properties. Model behavior as a function of each of these parameters is tested in the sensitivity analyses. Although the simulation of current conditions is not a calibration, it imparts some levels of confidence in simulation of future conditions. These simulations are used for two purposes: the strategic planning of Phase II field work (i.e., the placement of monitoring wells), and an assessment of risk posed by existing contamination associated with each of the sites.

O.4 Theory

The general principals of unsaturated transport of organic chemicals are addressed in this section. The migration of chemicals in soil-water systems is governed by convection-dispersion processes, which can be divided into three distinct mechanisms: (i) mass flow, or passive movement of the contaminant with the mass of water in which it is dissolved; (ii) liquid and gaseous diffusion, movement caused by molecular collisions; and (iii) chemical potential gradients in both liquid and vapor phases (Jury and Valentine, 1986). Hydrodynamic dispersion, which is the spreading of particles caused by three-dimensional mass flow at pore-scale, is not often accounted for in a volume averaged mathematical treatment of flow, or factored into the liquid diffusion term. A wide variety of biogeochemical processes influence the actual rate of chemical migration through a dense web of complicated interactions. These processes are grouped generally into five categories (Rao and Jessup, 1983; Donigan and Rao, 1986).

1. Advection
2. Sorption/desorption
3. Transformation/(bio)degradation
4. Volatilization

5. Plant processes

O.5 Sorption/Desorption

Sorption/desorption is one of the most important processes influencing the movement or leaching of a chemical. It is generally thought of as a partitioning between a solid (sorbed) phase and the liquid phase (i.e., infiltrating water), caused by hydrophobic and weak electrostatic interactions. The term "sorption" is used here so that no mechanistic connotations are implied; "adsorption" is a two-dimensional (i.e., monolayer) surface reaction. This partition is described mathematically by the distribution coefficient K_D, (Lyman, et al, 1982; Jury and Valentine 1986):

$$K_D = \frac{\mu g \ adsorbed \ contaminant/g \ soil}{\mu g \ contaminant/mL \ solution}$$

Not only does sorption/desorption by the solid phase influence chemical movement, the resident time on soil surface leads indirectly to increased potential for degradation. On the other hand, a more highly sorbed chemical would not be volatilize as readily as a nonsorbing chemical (given identical Henry's Law constant and geochemical parameters) because of lower concentrations in the liquid phase. The role of the distribution coefficient in mitigating chemical migration is given in an approximation of nonuniform flow by using average values for K_D, volumetric water content, diffusion-dispersion coefficient, and drainage flux (i.e., long time simulations) (Smith, et al, 1984) give the following form of the convection-dispersion equation:

$$K_D \frac{\partial CL}{\partial t} = \frac{D\partial^2 CL}{\partial z^2} - \frac{V\partial CL}{\partial z} + r$$

where: $V = J_w / \phi$, the macroscopic average pore water velocity (ft/yr)

J_w = Drainage flux (ft/yr)

C_L = Mass of contaminant per soil water volume (mg/l)

D = Diffusion-dispersion coefficient (ft^2/day)

ϕ = Water content

r = Reaction mass loss rate (mg/day)

The distribution coefficient as defined above is valid only if the sorption isotherm is linear, and the reactions are reversible and fast (i.e., relative to the time-scale of water flux). The linearity of isotherms for organic chemical sorption processes has been demonstrated for benzene (Rogers, et al, 1980), halogenated hydrocarbons and some substituted benzene compounds (Wilson, et al, 1981). However, Elabd (1984) and Johnson (1985) found that sorption behavior could be fit equally well with either a linear isotherm or the van Bemmelmen-Freundlich isotherm. If K_D is zero, then the chemical species of concern is unaffected by physiochemical reactions and moves with the same velocity as the water.

Because of the large variations in K_D, a parameter, K_{oc}, is introduced for organic compounds:

$$K_{oc} = f\,(K_{ow})$$

where: f_{oc} = soil organic carbon fraction

K_{oc} is the organic carbon partition coefficient and is defined as the ratio of the concentration associated with the organic fraction of soil to the concentration in aqueous solution.

Previous work (Lambert, 1967, 1968; Lambert, et al, 1965; Weed and Weber, 1974) demonstrated that the sorption of nonionic organic compounds could be correlated

statistically to the organic carbon content of a soil since it behaved as a solvent in a solvent extraction process. Chiou, et al, (1979) postulated that the sorption mechanism is equivalent on a macroscopic scale to a simple partition between two immiscible phases: water and soil organic matter. Karickhoff, et al, (1979) demonstrated the relation between sorption processes and the aqueous solubility of the sorbate. The parameter, K_{oc}, is nearly independent of soil type and particle size. The octanol-water partition coefficient, K_{ow}, is the ratio of concentrations in a selected organic phase (octanol) to that in water, and can be correlated statistically to K_{oc}:

$$K_{oc} = f\,(K_{ow})$$

If $K_D > 0$, then chemical movement is retarded as defined by the retardation coefficient, R:

$$R = 1 + \frac{P_b}{e} K_d = \frac{V}{V_E}$$

where:	P_b	=	Soil bulk density
	e	=	Effective porosity
	V	=	Macroscopic average pore water velocity (annual average drainage in unsaturated conditions)
	V_E	=	Macroscopic average velocity of chemical

The retardation of dissolved organic compounds is therefore dependent on the following parameters:

1. Soil bulk density
2. Effective porosity

3. Organic carbon partition coefficient

4. Soil organic carbon fraction

The soil bulk density and effective porosity can be determined in the laboratory for representative samples of varying lithology. The organic carbon partition coefficient can be found in literature or estimated from other chemical parameters, e.g., solubility in water of K_{ow} (Lyman, et al, 1982).

O.6 Biodegradation/Transformation

The biodegradation rate of a dissolved organic chemical is dependent on the species and activity of the soil microbial population. The active biomass that could degrade the organic chemicals to potentially innocuous forms varies with depth, as a result of decreasing soil temperature, oxidation-reduction potential and organic matter content. Because of the expected limited substrate in a high desert environment, the microbial population is likely to be limited to very shallow zones. Hence, once the organic chemical has moved past the zone of microbial activity, the only reactions are sorption and abiotic degradation processes.

O.7 Analytical Solutions to the Convection-Dipersion Equation

Analytical solutions to the one dimensional convection-dispersion equation can be applied to predict concentrations of organic chemicals in the unsaturated zone and in groundwater. The first solution is for steady uniform flow through a porous medium in which the source term, C_0, is a constant (steady, continuous injection). This would be the case if the soil or groundwater contamination at the source was to remain at the same concentration, indefinitely. An approximation of the solution of the convection-dispersion equation for this initial condition is given by:

where: C_0 = Initial concentration of the contaminant in soil or groundwater

$$\frac{C}{C_0} = \frac{1}{2}\, erfc\, \frac{[x - V_E t]}{[2(D_x t)^1/2]}$$

C = Concentration of the contaminant at a distance downgradient x, and a time, t

D_x = Longitudinal dispersion coefficient

erfc = Complementary error function

The second solution is for steady, uniform flow through a porous medium in which the source term, C_0, is a constant when $0 < t \leq t_0$. For $t > t_0$, $C_0 = 0$ (Crenel-type injection). This would be the case if the source for current contamination would cease to exist after a period of time. At some time later (t), the leakage of contaminants into soil or groundwater is stopped (i.e., contaminated soil is removed). This also assumes that there are no other sources in the area which affect the concentrations of the contaminants.

An approximation of the solution for this initial condition is given by:

$$\frac{C}{C_0} = \frac{1}{2}\, erfc\, \frac{[x - V_E t]}{[2(D_x t)^1/2]} - \frac{1}{2}\, erfc\, \frac{[x - V_E(t - t_0)]}{2[D_x(t - t_0)]^1/2}$$

for $t > t_0$

In the unsaturated zone, the infiltration rate of water is a function of net precipitation (plus net applied water) and the soil characteristics. The estimated seepage velocity of groundwater is give by:

$$V = (K \cdot i)/_e$$

where: K = Hydraulic conductivity (gal/day$\cdot$ft^2)

e = Effective porosity

i = Hydraulic gradient

The retardation factor has a major impact on solute migration in groundwater. The solute will migrate 1/R times as far as the surrounding groundwater over a given time period. Assumed values were considered to be conservative.

O.8 TNT Leaching Beds Unsaturated Zone Model

O.8.1 Introduction

The objectives of the unsaturated zone model were to simulate the distribution of 1,3,5 TNB in the soil at the TNT Leaching Beds subsite, and to estimate the quantity of 1,3,5 TNB discharged from the soil into the groundwater system. The simulated distribution of 1,3,5 TNB in the soil can be used to assist soil remediation planning. The simulated mass loading from the soil to groundwater was used as the boundary condition for the groundwater contaminant transport model. The model SESOIL was selected for this modeling effort.

SESOIL is a seasonal compartmental model designed to simulate the one dimensional transport of contaminant through an unsaturated soil column. The model was developed for the U.S. Environmental Protection Agency, Office of Toxic Substance, by Arthur D. Little Company (Bonazountas and Wagner,1984).

The model employs theoretically derived equations driven by climatic, soil property, geometric and chemical compound property data. The model simulates pollutant fate cycle by taking into account: advection, diffusion, volatilization, adsorption and desorption, chemical degradation or decay, biological transformation, hydrolysis, cation exchange, complexation chemistry, and other processes.

SESOIL has been evaluated and tested by Battelle Pacific Laboratory, Oak Ridge National Laboratory, and an EPA Laboratory (Murarka, 1984; Hetrick, et al. 1987). SESOIL was selected by the State of California for leaking underground fuel tank study (State of California, 1989). Review and comparison of SESOIL with other vadose zone model can be found in a publication by Hern and Melancon (1989).

O.8.2 Model Configuration

The model is structured as a 4-layer model having a surface area of 4413 square feet. The first layer simulated the soil from the ground surface to a depth of 0.5 feet, the thickness of the layer of explosive chemicals. Simulated depths for the base of the second, third, and fourth layers were located at 17,42.5, and 55 feet below grade respectively. The maximum depth of 55 feet represents the interface with the groundwater surface. Since the thickness of the vadose zone was only 55 feet, soil property was assumed to be homogeneous. Based on field study, soil layers 1,2,3,and 4 were modeled as loamy sand. The soil density was assumed to be 1.85 grams per cubic centimeter, and porosity 28%.

The SESOIL model requires data of precipitation, temperature, cloud cover, humidity, albeto, and the latitude of the site as model input. Sierra Army Depot is located on 40.15 degree latitude. The annual precipitation was determined to be about 4 inches per year. The climatic data on Sierra Army Depot site as required by SESOIL model were obtained from the U.S. Weather Bureau.

SESOIL model also requires data of chemical properties as model input. The general chemical properties of 1,3,5 TNB such as solubility, diffusion coefficient in air, molecular weight, and valence were found in standard chemical handbooks (Windholz, 1976; Dean, 1989). Since organic carbon content was not measured on the site, a value of 0.5% was used in this study. This was based on the field measurement of a similar study at Nellis Air Force Base site in Nevada.

Biologic degradation of organic compounds is generally simulated using both zero and first order reactions. A zero order reaction for biologic degradation is generally valid only in zones of high biologic activity. In contrast, first order reactions are used to describe the degradation of organic compounds in zones where biologic activity is at lower or residual values. At TNT Leaching Beds area, the biological degradation of 1,3,5 TNB was simulated as a first order decay function. Since 1,3,5 TNB is a stable chemical, the half-life period used to calculate degradation rate was selected as 10 years.

The actual values of SESOIL model input parameters are summarized in Table O.1.

O.9 Solute Transport Model at TNT Leaching Beds Site

0.9.1 Introduction

A two-dimensional finite difference solute transport and dispersion model was used to simulate movement of trichloroethylene (TCE) and 1,3,5 trinitrobenzene (TNB) at the TNT Leaching Beds Area. The Method Of Characteristics model (MOC) (Konikow and Bredehoeft, 1988) calculates transient changes in a solute dissolved in groundwater. The MOC model can take convective transport, hydrodynamic dispersion, and fluid sources into account, and has been updated to also account for chemical reactions which are likely to occur, such as adsorption, desorption, and chemical decay (Konikow and Bredehoeft, 1987). 1,3,5 TNB was chosen as a representative TNT compound to model because it was the most mobile of the explosives compounds found at the TNT Leaching Beds Area, and thus could conservatively represent the presence of other explosive compounds at this site. Numerous VOCs were found in the groundwater at this site. TCE was the most widely distributed of these and was modeled as a representative VOC at this site.

0.9.2 Model Configuration

A single 50-foot thick layer was used to simulate solute-transport at the TNT Leaching Beds Site. This roughly coincides with the maximum depth at which any compounds on

TABLE O-1

SUMMARY OF INPUT PARAMETERS
USED TO MODEL THE TRANSPORT OF TNB IN VADOSE ZONE

Parameter	Value	Units	Data Source
Meteorologic Data			
Precipation	4.0	in/yr	U.S. Weather Bureau. Data compiled by General Science Corp.
Range in Temperature	-1 to 21	degree	Same as above
Range in Cloud Cover	0.25 to 0.7	%	Same as above
Range in Humidity	0.3 to 0.7	%	Same as above
Average Albedo	0.27		Same as above
Latitude	41.5	degree	Topographic map
1,3,5-TNB Chemical Data			
Solubility	350	ppm	Merck Index
Air Diffusion Coefficient	0.0498	cm*cm/sec	Calculated
Henry's Law Constant	4.468E-07	atm*m**3/mol	Calculated
Molecular Weight	213	g/mol	Merck Index
Biodegration Rate (soil)	.00019	/day	Calculated
Biodegration Rate (water)	.00019	/day	Calculated
Koc	37	ppm	Calculated

TABLE O-1 (Continued)

SUMMARY OF INPUT PARAMETERS
USED TO MODEL THE TRANSPORT OF TNB IN VADOSE ZONE

Parameter	Value	Units	Data Source
Soil Data			
Soil Type	loamy sand		Estimated from field information
Density	1.85	g/cm*3	Same as above
Porosity	28	%	Same as above
Organic Carbon	.5	%	Estimated

the site were detected, and puts cell nodes at a depth of 25 feet where higher solute concentrations were detected. The model was divided horizontally in 90 columns and 60 rows, equally spaced in both directions (Figure O-1). Grid spacing was 50 feet to allow greater model resolution of plume movement, with a total area of 0.48 square miles.

Water level data from wells on the site were contoured at 0.2 foot intervals to obtain initial head values for the model (Figure O-2). Groundwater flow was mainly northwards at the TNT Leaching Beds. An apparent groundwater ridge bisected the site, although the gradient was extremely flat.

Longitudinal dispersivity over the TNT site was initially assigned a value of 100 feet in the model, and later modified to 130 feet. Transverse dispersivity was 20 percent of the longitudinal value. Effective porosity and storage coefficient were both assigned a value of 0.18. A storage coefficient of 0.18 indicates unconfined conditions, however, some parts of the aquifer may have been partially confined by localized silt/clay units. Bulk soil density was estimated to be 1.8 g/cc.

An important parameter which the MOC model took into account was the distribution factor, KD, from which the retardation factor, R, was calculated. The following assumptions and calculations were made for TCE and TNB to obtain the model input.

KD = foc*Koc + fio*Kio (for foc > .001) where
foc = fraction of organic carbon
Koc = partition coefficient for organic carbon
fio (fraction of inorganic carbon) = 1-foc
Kio = $SA/Kow^{0.16}$
SA = surface area of soil (m^2/g)
Kow = octanol-water partition coefficient

The fraction of organic carbon at the TNT site was estimated to be approximately .005, and the surface area of the soil as 0.02, equal to a fine, loamy sand. KD and R values calculated from these numbers were:

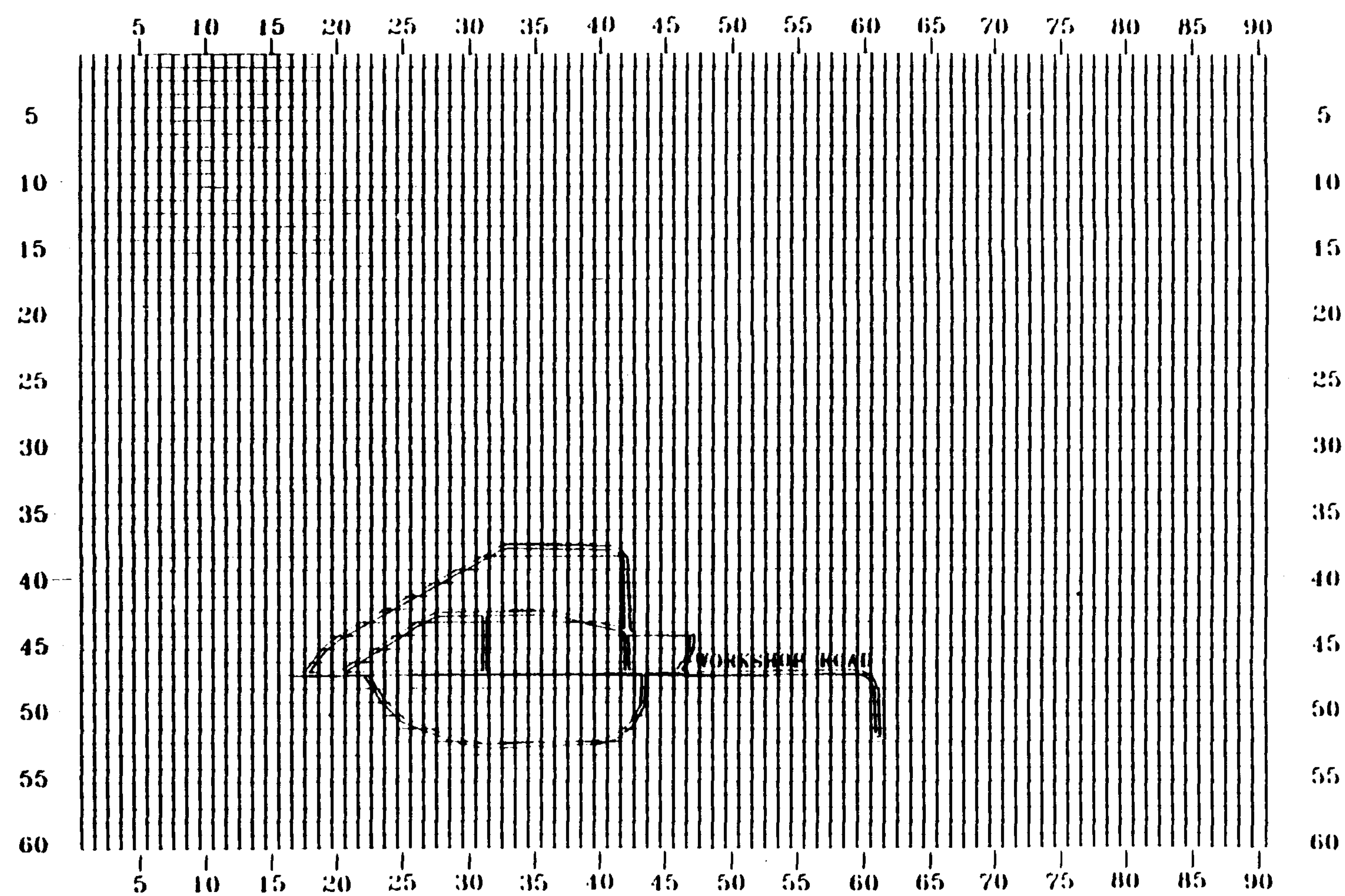


FIGURE O-1: MOC MODEL GRID FOR TNT LEACHING BEDS SITE

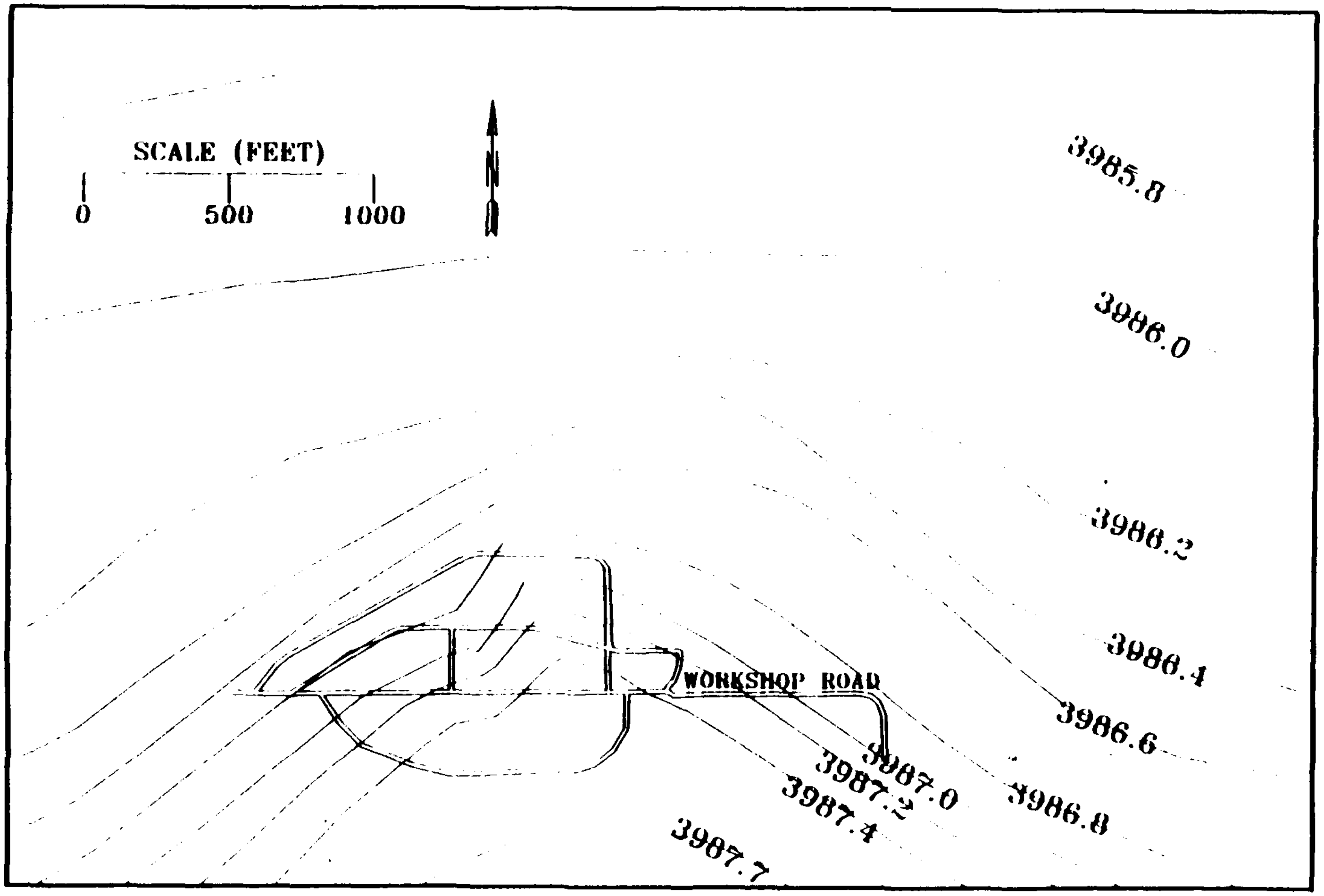


FIGURE O-2: 1990 GROUNDWATER SURFACE AT TNT SITE

	TCE	TNB
Kow	194	37.1
Koc	125	41.7
KD	.634	.220
R	2.34	3.20

$$R = 1 + \frac{pKD}{n}$$

where: p = Bulk soil density (g/cc) = 1.8
n = effective porosity = 0.18

The retardation factor has a major impact on solute migration in groundwater. The solute will migrate 1/R times as far as the surrounding groundwater over a given time period. Assumed values were considered to be conservative.

Appendix P

Installation Restoration Data Management System (IRDMS) Data Tables

JMM James M. Montgomery
Consulting Engineers Inc.

Location and Elevation Data from the GMA File of the IRDMS

JMM James M. Montgomery
Consulting Engineers Inc.

LSMP (MAP) REPORT
Wed Jan 9 15:37:19 1991

Installation = Sierra Ordnance Depot

Jan 9, 1991

SAMPLING POINT COORDINATE REPORT
INSTALLATION: Sierra Ordnance Depot

SITE TYPE	SITE ID	STATE PLANAR X-COORD	STATE PLANAR Y-COORD	U T M X-COORD	U T M Y-COORD	ELEV	AQUIFER	BORE NO.	DESCRIPTION
BORE	ALF-01-MWA	2525115	304503	745197	4448586	4079.1			
BORE	ALF-01-SB	2525433	303007	745299	4448131	4081.0			
BORE	ALF-02-MWA	2523896	304057	744827	4448446	4076.7			
BORE	ALF-02-SB	2524642	304144	745054	4448475	4077.0			
BORE	ALF-03-MWA	2524736	302893	745087	4448094	4085.4			
BORE	ALF-03-SB	2525281	304140	745249	4448476	4077.9			
BORE	ALF-04-SB	2524805	304076	745104	4448455	4077.9			
BORE	CCB-01-MWA	2524664	306151	745054	4449087	4065.6			
BORE	CCB-01-SB	2524615	305938	745040	4449022	4066.4			
BORE	CCB-02-MWA	2524516	305214	745012	4448801	4074.6			
BORE	CCB-02-SB	2524597	305777	745035	4448973	4068.1			
BORE	CCB-03-SB	2524631	305597	745046	4448918	4071.3			
BORE	CCB-04-SB	2524658	305026	745056	4448744	4076.7			
BORE	CCB-05-SB	2524979	304448	745156	4448569	4077.0			
BORE	DMO-03-MWA	2528127	303741	746118	4448364	4084.1			
BORE	DMO-04-MWA	2528023	303578	746087	4448314	4084.0			
BORE	DMO-05-MWA	2528086	303335	746107	4448240	4083.1			
BORE	DMO-06-SB	2528103	303656	746111	4448338	4082.8			
BORE	DMO-07-SB	2528109	303614	746113	4448325	4083.0			
BORE	DMO-08-SB	2528118	303551	746116	4448306	4082.5			
BORE	DMO-09-SB	2528114	303496	746115	4448289	4082.5			
BORE	DMO-10-SB	2528231	303661	746150	4448340	4082.4			
BORE	DMO-11-SB	2528234	303622	746151	4448328	4082.3			
BORE	DMO-12-SB	2528267	303691	746161	4448349	4082.9			
BORE	DMO-13-SB	2528286	303615	746167	4448326	4082.8			
BORE	DSB-01-MWA	2506265	344399	739316	4460687	3994.0			
BORE	DSB-01-SB	2506256	344465	739313	4460707	3993.5			
BORE	DSB-02-MWA	2516080	329656	742358	4456225	4000.1			
BORE	DSB-02-SB	2516069	329565	742355	4456197	4000.3			
BORE	DSB-03-SB	2525686	339413	745254	4459232	4003.8			
BORE	DSB-04-MWA	2525800	325653	745335	4455037	4007.3			
BORE	DSB-04-SB	2525790	325656	745332	4455038	4007.0			
BORE	DSB-05-SB	2517746	300985	742962	4447489	4105.5			
BORE	DSB-06-MWA	2527169	309659	745806	4450165	4042.3			
BORE	DSB-06-SB	2527093	309679	745783	4450171	4042.0			
BORE	TNT-01-MWB	2527030	309880	745763	4450232	4042.2			
BORE	TNT-01-MWC	2527030	309870	745763	4450229	4042.0			
BORE	TNT-02-MWB	2527653	310178	745952	4450325	4041.2			
BORE	TNT-02-MWC	2527653	310168	745952	4450322	4040.2			
BORE	TNT-07-MWB	2526881	310318	745716	4450365	4042.4			
BORE	TNT-07-MWC	2526894	310324	745720	4450367	4042.1			
BORE	TNT-07-SB	2525943	309485	745433	4450108	4044.5			
BORE	TNT-08-SB	2526067	309445	745471	4450096	4047.2			
BORE	TNT-09-SB	2526124	309473	745488	4450105	4045.9			
BORE	TNT-10-MWB	2526125	309624	745488	4450151	4043.0			
BORE	TNT-10-MWC	2526125	309637	745488	4450155	4041.8			
BORE	TNT-10-SB	2526199	309502	745511	4450114	4044.2			
BORE	TNT-11-SB	2526161	309588	745499	4450140	4043.4			
BORE	TNT-12-SB	2527162	310003	745803	4450270	4038.1			
BORE	TNT-13-SB	2527189	309987	745811	4450265	4038.9			

SAMPLING POINT COORDINATE REPORT
INSTALLATION: Sierra Ordnance Depot

SITE TYPE	SITE ID	STATE PLANAR X-COORD	STATE PLANAR Y-COORD	U T M X-COORD	U T M Y-COORD	ELEV	AQUIFER	BORE NO.	DESCRIPTION
BORE	TNT-14-SB	2527165	309944	745804	4450252	4039.1			
BORE	TNT-15-MWA	2527688	310407	745962	4450395	4037.2			
BORE	TNT-15-SB	2527142	309958	745797	4450256	4038.6			
BORE	TNT-16-MWA	2528131	310403	746097	4450395	4043.1			
BORE	TNT-16-SB	2527106	309912	745786	4450242	4039.5			
BORE	TNT-17-SB	2527128	309895	745793	4450237	4039.6			
BORE	TNT-18-SB	2527118	309879	745790	4450232	4040.2			
BORE	TNT-19-SB	2527099	309892	745784	4450236	4039.7			
COMP	TNT-01-SS	2527162	310003	745803	4450270	4038.1			
COMP	TNT-02-SS	2527189	309987	745811	4450265	4038.9			
COMP	TNT-03-SS	2527165	309944	745804	4450252	4039.1			
COMP	TNT-04-SS	2527142	309958	745797	4450256	4038.6			
COMP	TNT-05-SS	2527106	309912	745786	4450242	4039.5			
COMP	TNT-06-SS	2527128	309895	745793	4450237	4039.6			
COMP	TNT-07-SS	2527118	309879	745790	4450232	4040.2			
COMP	TNT-08-SS	2527099	309892	745784	4450236	4039.7			
WELL	ALF-01-MWA	2525115	304503	745197	4448586	4079.1			
WELL	ALF-02-MWA	2523896	304057	744827	4448446	4076.7			
WELL	ALF-03-MWA	2524736	302893	745087	4448094	4085.4			
WELL	CCB-01-MWA	2524664	306151	745054	4449087	4065.6			
WELL	CCB-02-MWA	2524516	305214	745012	4448801	4074.6			
WELL	DF-1-MW	2526524	309249	745611	4450038	4050.8			
WELL	DMO-03-MWA	2528127	303741	746118	4448364	4084.1			
WELL	DMO-04-MWA	2528023	303578	746087	4448314	4084.0			
WELL	DMO-05-MWA	2528086	303335	746107	4448240	4083.1			
WELL	DSB-01-MWA	2506265	344399	739316	4460687	3994.0			
WELL	DSB-02-MWA	2516080	329656	742358	4456225	4000.1			
WELL	DSB-04-MWA	2525800	325653	745335	4455037	4007.3			
WELL	DSB-06-MWA	2527169	309659	745806	4450165	4042.3			
WELL	LBG-1-MW	2530846	344311	746811	4460743	4011.4			
WELL	LBG-2-MW	2525551	339349	745213	4459212	4006.3			
WELL	LF-1-MW	2515122	307039	742142	4449326	4024.4			
WELL	LF-2-MW	2514126	308290	741834	4449704	4019.6			
WELL	LF-A-MW	2513812	308057	741739	4449632	4020.4			
WELL	LF-B-MW	2513356	308331	741599	4449714	4017.0			
WELL	LF-C-MW	2512493	308911	741334	4449888	4011.2			
WELL	LF-D-MW	2513882	309021	741757	4449926	4014.5			
WELL	LF-E-MW	2513986	308698	741790	4449828	4016.5			
WELL	LF-F-MW	2515003	308084	742102	4449644	4022.4			
WELL	LF-G-MW	2514017	307314	741804	4449406	4022.6			
WELL	LF-H-MW	2514102	307631	741829	4449503	4022.5			
WELL	LF-I-MW	2515559	306467	742277	4449153	4022.8			
WELL	LF-J-MW	2514338	306658	741904	4449207	4024.6			
WELL	LF-K-MW	2514862	305455	742068	4448842	4023.4			
WELL	LF-L-MW	2512738	307367	741414	4449418	4020.4			
WELL	LF-M-MW	2511741	308867	741105	4449872	4010.0			
WELL	LF-N-MW	2515588	309133	742277	4449966	4016.0			
WELL	LF-O-MW	2517424	306027	742847	4449025	4030.6			
WELL	P-1-MW	2523750	302435	744788	4447951	4086.5			
WELL	P-2-MW	2523636	302430	744753	4447949	4086.2			

Jan 9, 1991

SAMPLING POINT COORDINATE REPORT
INSTALLATION: Sierra Ordnance Depot

SITE TYPE	SITE ID	STATE PLANAR X-COORD	STATE PLANAR Y-COORD	U T M X-COORD	U T M Y-COORD	ELEV	AQUIFER	BORE NO.	DESCRIPTION
WELL	P-3-MW	2523890	302296	744831	4447909	4086.1			
WELL	PSW-02	2525612	301434	745359	4447652				
WELL	PSW-05	2519621	300945	743534	4447483				
WELL	PSW-08	2524359	301405	744977	4447639				
WELL	PSW-09	2519724	298687	743573	4446795				
WELL	TESTPT	2494680	279955	736000	4441000	0.0			
WELL	TNT-01-MWA	2527030	309893	745763	4450236	4042.0			
WELL	TNT-01-MWB	2527030	309880	745763	4450232	4042.2			
WELL	TNT-01-MWC	2527030	309870	745763	4450229	4042.0			
WELL	TNT-02-MWA	2527653	310185	745952	4450327	4041.0			
WELL	TNT-02-MWB	2527653	310178	745952	4450325	4041.2			
WELL	TNT-02-MWC	2527653	310168	745952	4450322	4040.2			
WELL	TNT-03-MWA	2527310	310320	745847	4450367	4039.4			
WELL	TNT-04-MWA	2527657	309899	745954	4450240	4040.6			
WELL	TNT-05-MWA	2527995	309391	746059	4450086	4045.4			
WELL	TNT-06-MWA	2527336	309663	745857	4450167	4041.4			
WELL	TNT-07-MWA	2526871	310318	745713	4450365	4042.7			
WELL	TNT-07-MWB	2526881	310318	745716	4450365	4042.4			
WELL	TNT-07-MWC	2526894	310324	745720	4450367	4042.1			
WELL	TNT-08-MWA	2526709	309890	745665	4450234	4042.4			
WELL	TNT-09-MWA	2526777	309561	745687	4450134	4042.3			
WELL	TNT-10-MWA	2526115	309621	745485	4450150	4043.0			
WELL	TNT-10-MWB	2526125	309624	745488	4450151	4043.0			
WELL	TNT-10-MWC	2526125	309637	745488	4450155	4041.8			
WELL	TNT-11-MWA	2525930	309436	745429	4450093	4046.3			
WELL	TNT-12-MWA	2526062	309878	745468	4450228	4037.0			
WELL	TNT-13-MWA	2526551	309606	745618	4450147	4043.2			
WELL	TNT-14-MWA	2525470	309953	745287	4450249	4035.9			
WELL	TNT-15-MWA	2527688	310407	745962	4450395	4037.2			
WELL	TNT-16-MWA	2528131	310403	746097	4450395	4043.1			

Program ended normally.$

Geotechnical and Field Drilling Data from the GFD File of the IRDMS

JMM James M. Montgomery
Consulting Engineers Inc.

GEOTECHNICAL FIELD DRILLING (GFD)
Installation: Sierra Ordnance Depot (SA)
Measurement Date Range: 01-jan-75 to 20-sep-90
Min (X,Y): (736000, 4410000) Max (X,Y): (746167, 4460707)

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	ALF-01-MWA	JM	15-feb-1990	ADVAU	02	0.0	106.5	-9999.0		
				DPTOT	01	-9999.0	-9999.0	106.5	FT	
				GRDWT	02	-9999.0	-9999.0	90.0	FT	
				USCS	01	0.0	35.0	-9999.0		SP
					01	35.0	1.0	-9999.0		SM
					01	36.0	4.5	-9999.0		SP
					01	40.5	8.0	-9999.0		SM
					01	48.5	11.5	-9999.0		SW
					01	60.0	8.0	-9999.0		SM
					01	68.0	3.0	-9999.0		SP
					01	71.0	1.0	-9999.0		SC
					01	72.0	8.5	-9999.0		SP
					01	80.5	1.0	-9999.0		ML
					01	81.5	8.5	-9999.0		SP
					01	90.0	7.0	-9999.0		ML
					01	97.0	8.5	-9999.0		SP
					01	105.5	0.5	-9999.0		ML
					01	106.0	0.5	-9999.0		SP
BORE	ALF-01-SB	JM	17-mar-1990	ADVAU	01	0.0	95.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	95.0	FT	
				GRDWT	02	-9999.0	-9999.0	94.5	FT	
				USCS	01	0.0	10.0	-9999.0		SP
					01	10.0	0.7	-9999.0		SM
					01	10.7	8.3	-9999.0		ML
					01	19.0	0.2	-9999.0		CL
					01	19.2	4.8	-9999.0		ML
					01	24.0	5.0	-9999.0		SP
					01	29.0	5.0	-9999.0		SW
					01	34.0	0.7	-9999.0		ML
					01	34.7	4.3	-9999.0		CL
					01	39.0	5.0	-9999.0		SP
					01	44.0	5.0	-9999.0		SW-SM
					01	49.0	10.0	-9999.0		SM
					01	59.0	5.0	-9999.0		SW
					01	64.0	5.0	-9999.0		SP
					01	69.0	0.7	-9999.0		SW
					01	69.7	4.3	-9999.0		ML
					01	74.0	10.0	-9999.0		SP
					01	84.0	6.0	-9999.0		SM
					01	90.0	3.0	-9999.0		ML
					01	93.0	1.5	-9999.0		SM
					01	94.5	0.5	-9999.0		ML
BORE	ALF-02-MWA	JM	17-feb-1990	ADVAU	02	0.0	107.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	107.0	FT	
				GRDWT	02	-9999.0	-9999.0	92.0	FT	
				USCS	01	0.0	25.5	-9999.0		SP
					01	25.5	0.5	-9999.0		SM

Site Type	Site id	Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	ALF-02-MWA	JM	17-feb-1990	USCS	01	26.0	4.0	-9999.0		SM
					01	30.0	0.2	-9999.0		ML
					01	30.2	5.0	-9999.0		ML
					01	35.2	0.2	-9999.0		CL
					01	35.4	4.6	-9999.0		SP
					01	40.0	0.5	-9999.0		ML
					01	40.5	4.5	-9999.0		SM
					01	45.0	0.5	-9999.0		ML
					01	45.5	4.5	-9999.0		SW
					01	50.0	0.6	-9999.0		CL
					01	50.6	0.1	-9999.0		OL
					01	50.7	10.6	-9999.0		SW
					01	61.3	0.2	-9999.0		ML
					01	61.5	8.5	-9999.0		SW
					01	70.0	0.4	-9999.0		ML
					01	70.4	9.6	-9999.0		SW
					01	80.0	2.0	-9999.0		SM
					01	82.0	5.0	-9999.0		CL
					01	87.0	2.0	-9999.0		SM-ML
					01	89.0	1.8	-9999.0		CL
					01	90.8	9.2	-9999.0		SM
					01	100.0	0.6	-9999.0		SW
					01	100.6	6.4	-9999.0		SP
BORE	ALF-02-SB	JM	18-mar-1990	ADVAU	01	0.0	89.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	89.0	FT	
				GRDWT	02	-9999.0	-9999.0	86.0	FT	
				USCS	01	0.0	9.0	-9999.0		SP
					01	9.0	2.0	-9999.0		NR
					01	11.0	3.0	-9999.0		SP-SM
					01	14.0	15.0	-9999.0		SF
					01	29.0	5.0	-9999.0		ML
					01	34.0	5.4	-9999.0		SP
					01	39.4	0.2	-9999.0		SM
					01	39.6	19.4	-9999.0		SP
					01	59.0	11.0	-9999.0		SP-ML
					01	70.0	18.0	-9999.0		ML
					01	88.0	1.0	-9999.0		SW
BORE	ALF-03-MWA	JM	19-feb-1990	ADVAU	02	0.0	107.5	-9999.0		
				DPTOT	01	-9999.0	-9999.0	107.5	FT	
				GRDWT	02	-9999.0	-9999.0	91.5	FT	
				USCS	01	0.0	9.0	-9999.0		SP
					01	9.0	6.6	-9999.0		SM
					01	15.6	0.1	-9999.0		CL-SM
					01	15.7	5.2	-9999.0		SM
					01	20.9	0.1	-9999.0		CL
					01	21.0	4.0	-9999.0		SW
					01	25.0	0.3	-9999.0		SM
					01	25.3	0.8	-9999.0		SP
					01	26.1	0.1	-9999.0		SM

Installation: Sierra Ordnance Depot (SA)
Measurement Date Range: 01-jan-75 to 20-sep-90
Min (X,Y): (736000, 4410000) Max (X,Y): (746167, 4460707)

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	ALF-03-MWA	JM	19-feb-1990	USCS	01	26.2	4.0	-9999.0		SP
					01	30.2	4.8	-9999.0		SP-CL
					01	35.0	0.5	-9999.0		ML
					01	35.5	0.2	-9999.0		CL-ML
					01	35.7	0.8	-9999.0		SW
					01	36.5	3.9	-9999.0		SM
					01	40.4	0.1	-9999.0		CL
					01	40.5	4.5	-9999.0		SP
					01	45.0	6.3	-9999.0		SW
					01	51.3	3.7	-9999.0		SM
					01	55.0	0.3	-9999.0		SP
					01	55.3	0.9	-9999.0		CL-ML
					01	56.2	3.8	-9999.0		SW
					01	60.0	0.4	-9999.0		ML
					01	60.4	9.6	-9999.0		SW
					01	70.0	0.3	-9999.0		ML
					01	70.3	0.2	-9999.0		SP
					01	70.5	4.5	-9999.0		CL
					01	75.0	5.0	-9999.0		SW
					01	80.0	10.0	-9999.0		SP
					01	90.0	0.6	-9999.0		SM
					01	90.6	9.4	-9999.0		SW
					01	100.0	0.7	-9999.0		SP
					01	100.7	0.3	-9999.0		SM
					01	101.0	6.5	-9999.0		CL
BORE	ALF-03-SB	JM	19-mar-1990	ADVAU	01	0.0	90.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	90.0	FT	
				NOGWT	01	-9999.0	-9999.0	-9999.0		
				USCS	01	0.0	9.0	-9999.0		NTLOGD
					01	9.0	21.0	-9999.0		SP
					01	30.0	4.0	-9999.0		SP-ML
					01	34.0	6.0	-9999.0		SP-CL
					01	40.0	4.0	-9999.0		SP
					01	44.0	5.0	-9999.0		SP-CL
					01	49.0	10.0	-9999.0		SP
					01	59.0	11.0	-9999.0		ML-SP
					01	70.0	7.0	-9999.0		SP
					01	77.0	3.0	-9999.0		SM
					01	80.0	5.0	-9999.0		SP
					01	85.0	2.5	-9999.0		SM-SP
					01	87.5	1.5	-9999.0		SP-SM
					01	89.0	1.0	-9999.0		SP
BORE	ALF-04-SB	JM	18-mar-1990	ADVAU	01	0.0	86.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	86.0	FT	
				GRDWT	02	-9999.0	-9999.0	85.0	FT	
				USCS	01	0.0	29.0	-9999.0		SP
					01	29.0	5.0	-9999.0		ML
					01	34.0	5.0	-9999.0		SP
					01	39.0	0.5	-9999.0		SM-ML

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	ALF-04-SB	JM	18-mar-1990	USCS	01	39.5	10.0	-9999.0		SP
					01	49.5	0.2	-9999.0		ML
					01	49.7	10.1	-9999.0		SP
					01	59.8	0.2	-9999.0		SM
					01	60.0	10.0	-9999.0		SW
					01	70.0	5.0	-9999.0		ML
					01	75.0	5.3	-9999.0		SM
					01	80.3	4.7	-9999.0		SP
					01	85.0	1.0	-9999.0		SM
BORE	CCB-01-MWA	JM	20-feb-1990	ADVAU	02	0.0	92.5	-9999.0		
				DPTOT	01	-9999.0	-9999.0	92.5	FT	
				GRDWT	02	-9999.0	-9999.0	76.0	FT	
				USCS	01	0.0	5.0	-9999.0		SW
					01	5.0	5.0	-9999.0		SP
					01	10.0	5.0	-9999.0		SW
					01	15.0	3.0	-9999.0		SM
					01	18.0	7.0	-9999.0		SP
					01	25.0	1.5	-9999.0		SP-ML
					01	26.5	4.9	-9999.0		ML
					01	31.4	3.6	-9999.0		SP
					01	35.0	5.0	-9999.0		SW
					01	40.0	5.0	-9999.0		SP-CL
					01	45.0	0.6	-9999.0		SM
					01	45.6	4.4	-9999.0		ML
					01	50.0	0.2	-9999.0		SM
					01	50.2	0.3	-9999.0		CL
					01	50.5	4.5	-9999.0		SM-CL
					01	55.0	5.0	-9999.0		ML-SM
					01	60.0	10.2	-9999.0		SM
					01	70.2	0.3	-9999.0		CL
					01	70.5	0.2	-9999.0		ML
					01	70.7	0.5	-9999.0		SP
					01	71.2	13.8	-9999.0		ML
					01	85.0	1.0	-9999.0		SW
					01	86.0	5.4	-9999.0		ML-SP
					01	91.4	0.3	-9999.0		SP
					01	91.7	0.3	-9999.0		ML
					01	92.0	0.5	-9999.0		CL
BORE	CCB-01-SB	JM	13-apr-1990	ADVAU	01	0.0	80.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	80.0	FT	
				GRDWT	02	-9999.0	-9999.0	79.0	FT	
				USCS	01	0.0	39.0	-9999.0		ML
					01	39.0	5.0	-9999.0		SM
					01	44.0	5.0	-9999.0		SP
					01	49.0	30.0	-9999.0		ML
					01	79.0	1.0	-9999.0		SW
BORE	CCB-02-MWA	JM	26-feb-1990	ADVAU	02	0.0	104.5	-9999.0		
				DPTOT	01	-9999.0	-9999.0	104.5	FT	

Installation: Sierra Ordnance Depot (SA)
Measurement Date Range: 01-jan-75 to 20-sep-90
Min (X,Y): (736000, 4410000) Max (X,Y): (746167, 4460707)

Site Type	Site id	Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	CCB-02-MWA	JM	26-feb-1990	GRDWT	02	-9999.0	-9999.0	88.0	FT	
				USCS	01	0.0	5.0	-9999.0		SM
					01	5.0	5.7	-9999.0		SW
					01	10.7	4.3	-9999.0		SM
					01	15.0	5.0	-9999.0		SP
					01	20.0	0.2	-9999.0		SW
					01	20.2	14.8	-9999.0		SM
					01	35.0	5.0	-9999.0		ML
					01	40.0	5.0	-9999.0		ML-CL
					01	45.0	1.1	-9999.0		SM
					01	46.1	3.9	-9999.0		SW
					01	50.0	10.0	-9999.0		SM
					01	60.0	1.0	-9999.0		SW
					01	61.0	9.0	-9999.0		SP
					01	70.0	10.2	-9999.0		SM
					01	80.2	9.8	-9999.0		SM-CL
					01	90.0	1.2	-9999.0		SM
					01	91.2	8.9	-9999.0		ML
					01	100.1	0.9	-9999.0		SM
					01	101.0	2.3	-9999.0		CL
					01	103.3	0.8	-9999.0		SM
					01	104.1	0.4	-9999.0		CL
BORE	CCB-02-SB	JM	12-apr-1990	ADVAU	01	0.0	88.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	88.0	FT	
				GRDWT	02	-9999.0	-9999.0	81.0	FT	
				USCS	01	0.0	14.0	-9999.0		ML
					01	14.0	5.0	-9999.0		SP
					01	19.0	25.0	-9999.0		ML
					01	44.0	0.2	-9999.0		SW
					01	44.2	26.3	-9999.0		ML
					01	70.5	1.0	-9999.0		NR
					01	71.5	0.1	-9999.0		SM
					01	71.6	7.4	-9999.0		ML
					01	79.0	9.0	-9999.0		SM
BORE	CCB-03-SB	JM	12-apr-1990	ADVAU	01	0.0	88.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	88.0	FT	
				NOGWT	01	-9999.0	-9999.0	-9999.0		
				USCS	01	0.0	39.0	-9999.0		ML
					01	39.0	1.0	-9999.0		SM
					01	40.0	19.0	-9999.0		ML
					01	59.0	10.0	-9999.0		CL
					01	69.0	19.0	-9999.0		ML
BORE	CCB-04-SB	JM	11-apr-1990	ADVAU	01	0.0	90.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	90.0	FT	
				GRDWT	02	-9999.0	-9999.0	89.0	FT	
				USCS	01	0.0	14.0	-9999.0		ML
					01	14.0	5.0	-9999.0		SP
					01	19.0	5.0	-9999.0		SM

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	CCB-04-SB	JM	11-apr-1990	USCS	01	24.0	35.0	-9999.0		ML
					01	59.0	20.0	-9999.0		SM
					01	79.0	10.5	-9999.0		ML
					01	89.5	0.5	-9999.0		SW
BORE	CCB-05-SB	JM	11-apr-1990	ADVAU	01	0.0	70.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	70.0	FT	
				NOGWT	01	-9999.0	-9999.0	-9999.0		
				USCS	01	0.0	34.0	-9999.0		ML
					01	34.0	5.0	-9999.0		ML-SM
					01	39.0	1.5	-9999.0		ML
					01	40.5	1.0	-9999.0		NR
					01	41.5	2.5	-9999.0		ML
					01	44.0	5.0	-9999.0		SW
					01	49.0	1.3	-9999.0		CL
					01	50.3	19.7	-9999.0		ML
BORE	DMO-03-MWA	JM	26-feb-1990	ADVAU	02	0.0	109.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	109.0	FT	
				GRDWT	02	-9999.0	-9999.0	93.0	FT	
				USCS	01	0.0	10.0	-9999.0		SM
					01	10.0	15.0	-9999.0		SW
					01	25.0	0.3	-9999.0		ML
					01	25.3	1.0	-9999.0		SW
					01	26.3	0.2	-9999.0		CL
					01	26.5	8.5	-9999.0		SP
					01	35.0	5.4	-9999.0		SW
					01	40.4	0.4	-9999.0		CL-ML
					01	40.8	4.2	-9999.0		SM
					01	45.0	5.0	-9999.0		SP
					01	50.0	0.5	-9999.0		ML
					01	50.5	9.5	-9999.0		SW
					01	60.0	10.7	-9999.C		SP
					01	70.7	0.2	-9999.0		CL
					01	70.9	19.1	-9999.0		SP
					01	90.0	1.0	-9999.0		CL
					01	91.0	9.0	-9999.0		SM
					01	100.0	0.3	-9999.0		CL
					01	100.3	0.5	-9999.0		SC
					01	100.8	6.7	-9999.0		CL
					01	107.5	0.5	-9999.0		SM
					01	108.0	1.0	-9999.0		CL
BORE	DMO-04-MWA	JM	28-feb-1990	ADVAU	02	0.0	109.5	-9999.0		
				DPTOT	01	-9999.0	-9999.0	109.5	FT	
				GRDWT	02	-9999.0	-9999.0	93.0	FT	
				USCS	01	0.0	10.6	-9999.0		ML
					01	10.6	0.2	-9999.0		SP
					01	10.8	9.2	-9999.0		ML
					01	20.0	1.2	-9999.0		SM
					01	21.2	0.2	-9999.0		ML

Installation: Sierra Ordnance Depot (SA)
Measurement Date Range: 01-jan-75 to 20-sep-90
Min (X,Y): (736000, 4410000) Max (X,Y): (746167, 4460707)

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DMO-04-MWA	JM	28-feb-1990	USCS	01	21.4	9.3	-9999.0		SM
					01	30.7	9.3	-9999.0		ML
					01	40.0	0.2	-9999.0		SM
					01	40.2	0.6	-9999.0		ML
					01	40.8	4.2	-9999.0		SM
					01	45.0	1.0	-9999.0		SW
					01	46.0	4.0	-9999.0		ML
					01	50.0	0.2	-9999.0		SM
					01	50.2	0.2	-9999.0		ML
					01	50.4	9.6	-9999.0		SM
					01	60.0	0.8	-9999.0		SP
					01	60.8	9.2	-9999.0		ML
					01	70.0	6.0	-9999.0		SW
					01	76.0	4.0	-9999.0		SP
					01	80.0	0.5	-9999.0		SW
					01	80.5	0.5	-9999.0		ML
					01	81.0	9.0	-9999.0		SW
					01	90.0	0.4	-9999.0		ML
					01	90.4	0.4	-9999.0		SP
					01	90.8	4.2	-9999.0		ML-SM
					01	95.0	5.5	-9999.0		SM
					01	100.5	0.6	-9999.0		ML
					01	101.1	7.9	-9999.0		SM
					01	109.0	0.3	-9999.0		SP
					01	109.3	0.2	-9999.0		SM
BORE	DMO-05-MWA	JM	27-feb-1990	ADVAU	02	0.0	110.5	-9999.0		
				DPTOT	01	-9999.0	-9999.0	110.5	FT	
				GRDWT	02	-9999.0	-9999.0	94.0	FT	
				USCS	01	0.0	10.0	-9999.0		SM
					01	10.0	5.0	-9999.0		SP
					01	15.0	5.0	-9999.0		SM
					01	20.0	5.6	-9999.0		SP
					01	25.6	4.4	-9999.0		ML
					01	30.0	10.0	-9999.0		SP
					01	40.0	0.5	-9999.0		ML
					01	40.5	19.5	-9999.0		SP
					01	60.0	1.2	-9999.0		ML
					01	61.2	8.8	-9999.0		SP
					01	70.0	0.4	-9999.0		ML
					01	70.4	0.4	-9999.0		CL
					01	70.8	0.7	-9999.0		SP
					01	71.5	8.5	-9999.0		SC
					01	80.0	0.2	-9999.0		CL
					01	80.2	9.8	-9999.0		SW
					01	90.0	1.0	-9999.0		SM
					01	91.0	0.6	-9999.0		SW
					01	91.6	2.4	-9999.0		SM
					01	94.0	15.9	-9999.0		ML
					01	109.9	0.1	-9999.0		SW
					01	110.0	0.5	-9999.0		ML

Installation: Sierra Ordnance Depot (SA)
Measurement Date Range: 01-jan-75 to 20-sep-90
Min (X,Y): (736000, 4410000) Max (X,Y): (746167, 4460707)

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DMO-06-SB	JM	26-mar-1990	ADVAU	01	0.0	96.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	96.0	FT	
				GRDWT	02	-9999.0	-9999.0	96.0	FT	
				USCS	01	0.0	5.0	-9999.0		SW
					01	5.0	5.0	-9999.0		NR
					01	10.0	5.0	-9999.0		SP
					01	15.0	5.0	-9999.0		SM
					01	20.0	5.0	-9999.0		SP
					01	25.0	15.0	-9999.0		SW
					01	40.0	0.5	-9999.0		SM
					01	40.5	9.5	-9999.0		SP
					01	50.0	0.2	-9999.0		SM
					01	50.2	9.8	-9999.0		ML
					01	60.0	10.0	-9999.0		SW
					01	70.0	10.0	-9999.0		SM
					01	80.0	10.0	-9999.0		SW
					01	90.0	5.0	-9999.0		CL
					01	95.0	0.5	-9999.0		ML
					01	95.5	0.5	-9999.0		SM
BORE	DMO-07-SB	JM	26-mar-1990	ADVAU	01	0.0	94.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	94.0	FT	
				GRDWT	02	-9999.0	-9999.0	94.0	FT	
				USCS	01	0.0	24.4	-9999.0		SP
					01	24.4	0.3	-9999.0		ML
					01	24.7	4.3	-9999.0		SP
					01	29.0	5.3	-9999.0		SW
					01	34.3	0.2	-9999.0		SP
					01	34.5	9.5	-9999.0		SW
					01	44.0	5.0	-9999.0		ML
					01	49.0	0.2	-9999.0		CL
					01	49.2	0.5	-9999.0		SM
					01	49.7	0.7	-9999.0		ML
					01	50.4	8.6	-9999.0		CL
					01	59.0	10.0	-9999.0		ML
					01	69.0	10.0	-9999.0		SM-ML
					01	79.0	15.0	-9999.0		SW
BORE	DMO-08-SB	JM	27-mar-1990	ADVAU	01	0.0	95.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	95.0	FT	
				GRDWT	02	-9999.0	-9999.0	94.5	FT	
				USCS	01	0.0	9.0	-9999.0		SP
					01	9.0	0.5	-9999.0		ML
					01	9.5	4.5	-9999.0		SM
					01	14.0	5.0	-9999.0		ML
					01	19.0	5.0	-9999.0		SP
					01	24.0	5.0	-9999.0		SM
					01	29.0	5.0	-9999.0		SP
					01	34.0	1.0	-9999.0		SM
					01	35.0	4.0	-9999.0		SP

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DMO-08-SB	JM	27-mar-1990	USCS	01	39.0	0.7	-9999.0		SW
					01	39.7	4.3	-9999.0		ML
					01	44.0	5.0	-9999.0		SP
					01	49.0	0.6	-9999.0		SM
					01	49.6	0.9	-9999.0		ML
					01	50.5	11.5	-9999.0		SP
					01	62.0	17.0	-9999.0		SM
					01	79.0	1.0	-9999.0		NR
					01	80.0	9.0	-9999.0		SW
					01	89.0	0.6	-9999.0		ML
					01	89.6	4.9	-9999.0		SM
					01	94.5	0.5	-9999.0		ML
BORE	DMO-09-SB	JM	28-mar-1990	ADVAU	01	0.0	94.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	94.0	FT	
				GRDWT	02	-9999.0	-9999.0	94.0	FT	
				USCS	01	0.0	9.0	-9999.0		ML
					01	9.0	5.0	-9999.0		SP
					01	14.0	5.0	-9999.0		ML
					01	19.0	10.0	-9999.0		SP
					01	29.0	5.0	-9999.0		ML
					01	34.0	6.0	-9999.0		SM
					01	40.0	9.0	-9999.0		ML
					01	49.0	1.0	-9999.0		SM
					01	50.0	9.0	-9999.0		ML
					01	59.0	10.0	-9999.0		SW
					01	69.0	10.0	-9999.0		ML
					01	79.0	1.0	-9999.0		SW
					01	80.0	9.0	-9999.0		SP
					01	89.0	5.0	-9999.0		ML
BORE	DMO-10-SB	JM	28-mar-1990	ADVAU	01	0.0	95.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	95.0	FT	
				GRDWT	02	-9999.0	-9999.0	95.0	FT	
				USCS	01	0.0	9.0	-9999.0		ML
					01	9.0	5.0	-9999.0		SM
					01	14.0	5.0	-9999.0		ML
					01	19.0	5.0	-9999.0		SP
					01	24.0	10.0	-9999.0		SW
					01	34.0	2.0	-9999.0		NR
					01	36.0	3.0	-9999.0		SW
					01	39.0	1.0	-9999.0		ML
					01	40.0	0.5	-9999.0		SP
					01	40.5	9.7	-9999.0		ML
					01	50.2	8.8	-9999.0		SW
					01	59.0	10.0	-9999.0		ML
					01	69.0	0.5	-9999.0		CL
					01	69.5	9.5	-9999.0		ML
					01	79.0	0.7	-9999.0		SW
					01	79.7	9.3	-9999.0		SP
					01	89.0	0.3	-9999.0		ML

Site Type	Site id	Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DMO-10-SB	JM	28-mar-1990	USCS	01	89.3	0.4	-9999.0		SW
					01	89.7	5.3	-9999.0		SM
BORE	DMO-11-SB	JM	30-mar-1990	ADVAU	01	0.0	94.5	-9999.0		
				DPTOT	01	-9999.0	-9999.0	94.5	FT	
				GRDWT	02	-9999.0	-9999.0	94.5	FT	
				USCS	01	0.0	19.0	-9999.0		ML
					01	19.0	0.3	-9999.0		SM
					01	19.3	4.7	-9999.0		ML
					01	24.0	5.7	-9999.0		SM
					01	29.7	4.3	-9999.0		ML
					01	34.0	1.0	-9999.0		NR
					01	35.0	4.0	-9999.0		SP
					01	39.0	0.7	-9999.0		SM
					01	39.7	1.0	-9999.0		ML
					01	40.7	3.3	-9999.0		SM
					01	44.0	5.8	-9999.0		ML
					01	49.8	9.2	-9999.0		SP
					01	59.0	20.0	-9999.0		ML
					01	79.0	0.8	-9999.0		CL
					01	79.8	9.2	-9999.0		ML
					01	89.0	5.5	-9999.0		SW
BORE	DMO-12-SB	JM	20-mar-1990	ADVAU	01	0.0	95.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	95.0	FT	
				GRDWT	02	-9999.0	-9999.0	95.0	FT	
				USCS	01	0.0	20.6	-9999.0		SP
					01	20.6	3.4	-9999.0		SM
					01	24.0	10.0	-9999.0		SP
					01	34.0	5.0	-9999.0		SM
					01	39.0	0.5	-9999.0		ML
					01	39.5	0.1	-9999.0		CL
					01	39.6	9.4	-9999.0		SP
					01	49.0	10.0	-9999.0		SM
					01	59.0	5.0	-9999.0		CL
					01	64.0	5.9	-9999.0		SM
					01	69.9	4.1	-9999.0		CL
					01	74.0	5.0	-9999.0		ML
					01	79.0	10.3	-9999.0		SM
					01	89.3	0.3	-9999.0		CL
					01	89.6	5.4	-9999.0		SM
BORE	DMO-13-SB	JM	20-mar-1990	ADVAU	01	0.0	100.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	100.0	FT	
				GRDWT	02	-9999.0	-9999.0	99.0	FT	
				USCS	01	0.0	9.0	-9999.0		ML
					01	9.0	5.0	-9999.0		SW
					01	14.0	5.0	-9999.0		ML
					01	19.0	5.0	-9999.0		SW
					01	24.0	5.0	-9999.0		SM
					01	29.0	10.0	-9999.0		SP

Site Type	Site id	Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DMO-13-SB	JM	20-mar-1990	USCS	01	39.0	10.0	-9999.0		ML
					01	49.0	0.4	-9999.0		CL
					01	49.4	0.6	-9999.0		SW
					01	50.0	9.0	-9999.0		ML
					01	59.0	10.0	-9999.0		CL
					01	69.0	5.0	-9999.0		SM
					01	74.0	5.0	-9999.0		ML
					01	79.0	10.0	-9999.0		SM-CL
					01	89.0	10.0	-9999.0		CL
					01	99.0	1.0	-9999.0		SM-CL
BORE	DSB-01-MWA	JM	03-mar-1990	ADVAU	08	0.0	33.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	33.0	FT	
				GRDWT	02	-9999.0	-9999.0	12.0	FT	
				USCS	01	0.0	5.0	-9999.0		SM
					01	5.0	10.0	-9999.0		ML
					01	15.0	1.5	-9999.0		SM
					01	16.5	3.5	-9999.0		ML
					01	20.0	5.0	-9999.0		SM
					01	25.0	8.0	-9999.0		ML
BORE	DSB-01-SB	JM	01-mar-1990	ADVAU	26	0.0	250.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	250.0	FT	
				GRDWT	02	-9999.0	-9999.0	15.0	FT	
				USCS	01	0.0	3.3	-9999.0		SM
					01	3.3	1.6	-9999.0		ML
					01	4.9	0.9	-9999.0		SM
					01	5.8	5.7	-9999.0		ML
					01	11.5	3.5	-9999.0		CL
					01	15.0	4.0	-9999.0		ML
					01	19.0	0.5	-9999.0		SM
					01	19.5	0.5	-9999.0		NR
					01	20.0	2.6	-9999.0		SM
					01	22.6	8.7	-9999.0		ML
					01	31.3	0.7	-9999.0		NR
					01	32.0	2.0	-9999.0		ML
					01	34.0	6.5	-9999.0		SM-ML
					01	40.5	0.5	-9999.0		SM
					01	41.0	9.3	-9999.0		ML
					01	50.3	1.3	-9999.0		ML-SM
					01	51.6	0.4	-9999.0		NR
					01	52.0	4.5	-9999.0		ML
					01	56.5	0.5	-9999.0		NR
					01	57.0	3.2	-9999.0		ML
					01	60.2	0.4	-9999.0		ML-SM
					01	60.6	1.2	-9999.0		SM
					01	61.8	0.2	-9999.0		NR
					01	62.0	2.1	-9999.0		SM
					01	64.1	2.7	-9999.0		ML
					01	66.8	0.7	-9999.0		NR
					01	67.5	4.9	-9999.0		ML

Site Type	Site id	Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DSB-01-SB	JM	01-mar-1990	USCS	01	72.4	0.7	-9999.0		CL
					01	73.1	9.6	-9999.0		ML
					01	82.7	0.3	-9999.0		NR
					01	83.0	2.5	-9999.0		ML
					01	85.5	2.5	-9999.0		CL
					01	88.0	5.0	-9999.0		ML-CL
					01	93.0	19.5	-9999.0		ML
					01	112.5	0.5	-9999.0		NR
					01	113.0	4.5	-9999.0		ML
					01	117.5	0.5	-9999.0		NR
					01	118.0	4.0	-9999.0		ML
					01	122.0	0.2	-9999.0		SM
					01	122.2	0.3	-9999.0		ML
					01	122.5	0.5	-9999.0		NR
					01	123.0	35.8	-9999.0		ML
					01	158.8	0.2	-9999.0		NR
					01	159.0	20.5	-9999.0		ML
					01	179.5	0.5	-9999.0		NR
					01	180.0	54.7	-9999.0		ML
					01	234.7	0.3	-9999.0		NR
					01	235.0	15.0	-9999.0		ML
BORE	DSB-02-MWA	JM	04-mar-1990	ADVAU	08	0.0	41.5	-9999.0		
				DPTOT	01	-9999.0	-9999.0	41.5	FT	
				GRDWT	02	-9999.0	-9999.0	20.0	FT	
				USCS	01	0.0	5.0	-9999.0		ML
					01	5.0	10.0	-9999.0		SM
					01	15.0	5.0	-9999.0		ML
					01	20.0	5.0	-9999.0		ML-CL
					01	25.0	16.5	-9999.0		ML
BORE	DSB-02-SB	JM	06-mar-1990	ADVAU	26	0.0	250.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	250.0	FT	
				GRDWT	02	-9999.0	-9999.0	20.0	FT	
				USCS	01	0.0	2.1	-9999.0		ML
					01	2.1	0.9	-9999.0		NR
					01	3.0	3.0	-9999.0		SM
					01	6.0	1.8	-9999.0		ML
					01	7.8	1.0	-9999.0		SP
					01	8.8	1.2	-9999.0		ML
					01	10.0	4.7	-9999.0		SM
					01	14.7	0.3	-9999.0		NR
					01	15.0	4.7	-9999.0		SM
					01	19.7	0.3	-9999.0		NR
					01	20.0	2.2	-9999.0		SM
					01	22.2	1.1	-9999.0		CL
					01	23.3	1.2	-9999.0		ML
					01	24.5	0.5	-9999.0		NR
					01	25.0	1.0	-9999.0		ML
					01	26.0	2.0	-9999.0		SM
					01	28.0	3.7	-9999.0		ML

Installation: Sierra Ordnance Depot (SA)
Measurement Date Range: 01-jan-75 to 20-sep-90
Min (X,Y): (736000, 4410000) Max (X,Y): (746167, 4460707)

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DSB-02-SB	JM	06-mar-1990	USCS	01	31.7	0.3	-9999.0		NR
					01	32.0	4.5	-9999.0		SM
					01	36.5	0.5	-9999.0		NR
					01	37.0	2.2	-9999.0		ML-SM
					01	39.2	2.8	-9999.0		NR
					01	42.0	3.5	-9999.0		SM
					01	45.5	1.5	-9999.0		NR
					01	47.0	1.8	-9999.0		SM
					01	48.8	2.2	-9999.0		NR
					01	51.0	1.0	-9999.0		SM
					01	52.0	0.5	-9999.0		ML
					01	52.5	0.5	-9999.0		SM
					01	53.0	1.5	-9999.0		ML
					01	54.5	1.5	-9999.0		NR
					01	56.0	0.6	-9999.0		SM
					01	56.6	1.1	-9999.0		ML
					01	57.7	3.0	-9999.0		SM
					01	60.7	0.3	-9999.0		NR
					01	61.0	10.0	-9999.0		SM
					01	71.0	0.5	-9999.0		NR
					01	71.5	13.5	-9999.0		SM
					01	85.0	2.0	-9999.0		ML
					01	87.0	5.7	-9999.0		SM
					01	92.7	0.3	-9999.0		NR
					01	93.0	1.5	-9999.0		SM
					01	94.5	1.5	-9999.0		NR
					01	96.0	2.2	-9999.0		SM
					01	98.2	0.3	-9999.0		NR
					01	98.5	2.7	-9999.0		SM
					01	101.2	0.3	-9999.0		NR
					01	101.5	3.3	-9999.0		SM
					01	104.8	0.2	-9999.0		ML
					01	105.0	0.8	-9999.0		SP
					01	105.8	0.9	-9999.0		CL
					01	106.7	3.3	-9999.0		NR
					01	110.0	1.9	-9999.0		SM
					01	111.9	0.9	-9999.0		ML
					01	112.8	0.2	-9999.0		SM
					01	113.0	0.5	-9999.0		NR
					01	113.5	7.2	-9999.0		SM
					01	120.7	3.3	-9999.0		NR
					01	124.0	1.8	-9999.0		SM
					01	125.8	0.2	-9999.0		NR
					01	126.0	3.5	-9999.0		SM
					01	129.5	2.0	-9999.0		ML
					01	131.5	2.0	-9999.0		SM
					01	133.5	2.5	-9999.0		SP
					01	136.0	2.0	-9999.0		ML
					01	138.0	0.5	-9999.0		NR
					01	138.5	2.3	-9999.0		SM
					01	140.8	0.7	-9999.0		NR

Installation: Sierra Ordnance Depot (SA)
Measurement Date Range: 01-jan-75 to 20-sep-90
Min (X,Y): (736000, 4410000) Max (X,Y): (746167, 4460707)

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DSB-02-SB	JM	06-mar-1990	USCS	01	141.5	8.3	-9999.0		SM
					01	149.8	0.2	-9999.0		NR
					01	150.0	4.7	-9999.0		SM
					01	154.7	0.3	-9999.0		NR
					01	155.0	5.5	-9999.0		SM
					01	160.5	4.5	-9999.0		ML
					01	165.0	0.4	-9999.0		CL
					01	165.4	0.6	-9999.0		SM
					01	166.0	0.5	-9999.0		ML
					01	166.5	2.5	-9999.0		SM
					01	169.0	2.8	-9999.0		ML
					01	171.8	0.7	-9999.0		SM
					01	172.5	2.0	-9999.0		ML
					01	174.5	1.2	-9999.0		SM
					01	175.7	0.3	-9999.0		NR
					01	176.0	3.7	-9999.0		SM
					01	179.7	0.3	-9999.0		NR
					01	180.0	4.8	-9999.0		SM
					01	184.8	0.2	-9999.0		NR
					01	185.0	4.5	-9999.0		SM
					01	189.5	0.5	-9999.0		NR
					01	190.0	4.8	-9999.0		SM
					01	194.8	0.2	-9999.0		NR
					01	195.0	3.0	-9999.0		SM
					01	198.0	0.3	-9999.0		ML
					01	198.3	0.2	-9999.0		NR
					01	198.5	1.5	-9999.0		ML-CL
					01	200.0	1.0	-9999.0		NR
					01	201.0	1.5	-9999.0		ML-CL
					01	202.5	1.2	-9999.0		ML
					01	203.7	0.3	-9999.0		NR
					01	204.0	0.8	-9999.0		ML
					01	204.8	0.9	-9999.0		SM
					01	205.7	3.9	-9999.0		ML
					01	209.6	0.4	-9999.0		SM
					01	210.0	0.7	-9999.0		ML
					01	210.7	0.3	-9999.0		NR
					01	211.0	0.4	-9999.0		ML
					01	211.4	1.0	-9999.0		SM
					01	212.4	2.1	-9999.0		ML
					01	214.5	1.5	-9999.0		NR
					01	216.0	4.0	-9999.0		ML
					01	220.0	0.2	-9999.0		SM
					01	220.2	0.8	-9999.0		ML
					01	221.0	3.3	-9999.0		SM
					01	224.3	1.5	-9999.0		ML
					01	225.8	0.2	-9999.0		NR
					01	226.0	0.8	-9999.0		ML
					01	226.8	1.7	-9999.0		SM
					01	228.5	1.0	-9999.0		ML
					01	229.5	6.5	-9999.0		SM

Installation: Sierra Ordnance Depot (SA)
Measurement Date Range: 01-jan-75 to 20-sep-90
Min (X,Y): (736000, 4410000) Max (X,Y): (746167, 4460707)

Site Type	Site Id	Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DSB-02-SB	JM	06-mar-1990	USCS	01	236.0	3.0	-9999.0		ML
					01	239.0	1.5	-9999.0		SM
					01	240.5	0.5	-9999.0		NR
					01	241.0	7.0	-9999.0		ML
					01	248.0	1.1	-9999.0		SM
					01	249.1	0.9	-9999.0		ML
BORE	DSB-03-SB	JM	15-feb-1990	ADVAU	26	0.0	250.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	250.0	FT	
				GRDWT	02	-9999.0	-9999.0	85.0	FT	
				USCS	01	0.0	0.8	-9999.0		ML
					01	0.8	0.7	-9999.0		NR
					01	1.5	2.0	-9999.0		ML
					01	3.5	1.7	-9999.0		SM
					01	5.2	0.8	-9999.0		CL
					01	6.0	1.0	-9999.0		SM
					01	7.0	1.5	-9999.0		ML
					01	8.5	0.5	-9999.0		NR
					01	9.0	3.2	-9999.0		SM
					01	12.2	8.3	-9999.0		CL
					01	20.5	0.5	-9999.0		NR
					01	21.0	0.8	-9999.0		CL-SM
					01	21.8	3.0	-9999.0		SM
					01	24.8	0.2	-9999.0		NR
					01	25.0	1.5	-9999.0		SM
					01	26.5	4.5	-9999.0		NR
					01	31.0	4.0	-9999.0		SM
					01	35.0	1.0	-9999.0		NR
					01	36.0	2.5	-9999.0		SM
					01	38.5	1.0	-9999.0		NR
					01	39.5	1.1	-9999.0		ML
					01	40.6	0.7	-9999.0		SM
					01	41.3	1.7	-9999.0		ML
					01	43.0	0.5	-9999.0		NR
					01	43.5	2.5	-9999.0		SM
					01	46.0	2.5	-9999.0		ML
					01	48.5	1.1	-9999.0		ML-CL
					01	49.6	5.6	-9999.0		CL
					01	55.2	1.5	-9999.0		CL-ML
					01	56.7	12.5	-9999.0		ML
					01	69.2	5.3	-9999.0		CL
					01	74.5	1.7	-9999.0		SM
					01	76.2	0.3	-9999.0		ML
					01	76.5	9.9	-9999.0		SM
					01	86.4	7.5	-9999.0		ML
					01	93.9	0.3	-9999.0		SM
					01	94.2	6.7	-9999.0		ML
					01	100.9	0.6	-9999.0		NR
					01	101.5	1.4	-9999.0		ML
					01	102.9	0.3	-9999.0		SM
					01	103.2	2.9	-9999.0		ML

Site	Type/Site id	Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DSB-03-SB	JM	15-feb-1990	USCS	01	106.1	0.8	-9999.0		SM
					01	106.9	2.1	-9999.0		ML
					01	109.0	0.3	-9999.0		SM
					01	109.3	7.2	-9999.0		ML
					01	116.5	0.2	-9999.0		SM
					01	116.7	3.3	-9999.0		ML
					01	120.0	1.9	-9999.0		SM
					01	121.9	8.6	-9999.0		ML
					01	130.5	1.0	-9999.0		NR
					01	131.5	1.4	-9999.0		ML
					01	132.9	0.1	-9999.0		SM-ML
					01	133.0	1.0	-9999.0		NR
					01	134.0	0.2	-9999.0		SM
					01	134.2	2.0	-9999.0		ML
					01	136.2	0.3	-9999.0		SM
					01	136.5	1.2	-9999.0		ML
					01	137.7	0.3	-9999.0		NR
					01	138.0	7.0	-9999.0		ML
					01	145.0	4.5	-9999.0		NR
					01	149.5	3.3	-9999.0		ML
					01	152.8	1.1	-9999.0		SM
					01	153.9	6.1	-9999.0		ML
					01	160.0	0.3	-9999.0		SM
					01	160.3	4.1	-9999.0		ML
					01	164.4	0.6	-9999.0		SM
					01	165.0	1.0	-9999.0		ML
					01	166.0	1.0	-9999.0		NR
					01	167.0	0.3	-9999.0		SM
					01	167.3	3.4	-9999.0		ML
					01	170.7	0.3	-9999.0		SM
					01	171.0	11.3	-9999.0		ML
					01	182.3	0.8	-9999.0		NR
					01	183.1	7.7	-9999.0		ML
					01	190.8	1.0	-9999.0		NR
					01	191.8	3.5	-9999.0		ML
					01	195.3	0.7	-9999.0		NR
					01	196.0	0.9	-9999.0		ML
					01	196.9	1.0	-9999.0		NR
					01	197.9	14.6	-9999.0		ML
					01	212.5	0.5	-9999.0		NR
					01	213.0	7.5	-9999.0		ML
					01	220.5	0.3	-9999.0		SM
					01	220.8	1.0	-9999.0		NR
					01	221.8	0.2	-9999.0		ML
					01	222.0	0.7	-9999.0		SM
					01	222.7	0.2	-9999.0		ML
					01	222.9	5.1	-9999.0		NR
					01	228.0	4.0	-9999.0		ML
					01	232.0	0.1	-9999.0		SM
					01	232.1	4.1	-9999.0		ML
					01	236.2	1.0	-9999.0		NR

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DSB-03-SB	JM	15-feb-1990	USCS	01	237.2	4.1	-9999.0		ML
					01	241.3	5.6	-9999.0		NR
					01	246.9	3.1	-9999.0		ML
BORE	DSB-04-MWA	JM	05-mar-1990	ADVAU	08	0.0	46.5	-9999.0		
				DPTOT	01	-9999.0	-9999.0	46.5	FT	
				GRDWT	02	-9999.0	-9999.0	25.5	FT	
				USCS	01	0.0	15.0	-9999.0		SM
					01	15.0	5.0	-9999.0		SW
					01	20.0	5.0	-9999.0		SP
					01	25.0	5.0	-9999.0		ML
					01	30.0	6.0	-9999.0		SM
					01	36.0	4.0	-9999.0		ML
					01	40.0	1.0	-9999.0		SM
					01	41.0	4.0	-9999.0		ML
					01	45.0	1.5	-9999.0		SM
BORE	DSB-04-SB	JM	14-mar-1990	ADVAU	26	0.0	250.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	250.0	FT	
				GRDWT	02	-9999.0	-9999.0	20.0	FT	
				USCS	01	0.0	0.7	-9999.0		ML
					01	0.7	0.8	-9999.0		NR
					01	1.5	0.7	-9999.0		ML
					01	2.2	4.8	-9999.0		SM
					01	7.0	1.2	-9999.0		ML
					01	8.2	0.3	-9999.0		NR
					01	8.5	0.3	-9999.0		SM
					01	8.8	0.7	-9999.0		NR
					01	9.5	4.2	-9999.0		SM
					01	13.7	1.3	-9999.0		NR
					01	15.0	3.5	-9999.0		SM
					01	18.5	0.2	-9999.0		NR
					01	18.7	3.8	-9999.0		SM
					01	22.5	0.5	-9999.0		NR
					01	23.0	1.0	-9999.0		SM
					01	24.0	1.9	-9999.0		ML
					01	25.9	0.6	-9999.0		NR
					01	26.5	2.5	-9999.0		SM
					01	29.0	2.0	-9999.0		ML-CL
					01	31.0	0.5	-9999.0		NR
					01	31.5	3.0	-9999.0		SM
					01	34.5	1.5	-9999.0		NR
					01	36.0	0.8	-9999.0		SW
					01	36.8	0.7	-9999.0		ML
					01	37.5	2.5	-9999.0		NR
					01	40.0	2.5	-9999.0		SP
					01	42.5	0.5	-9999.0		NR
					01	43.0	2.2	-9999.0		SM
					01	45.2	0.8	-9999.0		NR
					01	46.0	0.8	-9999.0		SM
					01	46.8	0.7	-9999.0		ML

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DSB-04-SB	JM	14-mar-1990	USCS	01	47.5	0.8	-9999.0		SM
					01	48.3	1.0	-9999.0		ML
					01	49.3	0.7	-9999.0		NR
					01	50.0	2.3	-9999.0		SM
					01	52.3	1.5	-9999.0		ML
					01	53.8	1.0	-9999.0		SM
					01	54.8	0.2	-9999.0		NR
					01	55.0	4.0	-9999.0		SW
					01	59.0	2.0	-9999.0		SM
					01	61.0	2.0	-9999.0		ML
					01	63.0	1.0	-9999.0		NR
					01	64.0	0.8	-9999.0		ML
					01	64.8	1.5	-9999.0		SM
					01	66.3	0.2	-9999.0		NR
					01	66.5	0.4	-9999.0		SW
					01	66.9	1.0	-9999.0		ML
					01	67.9	1.1	-9999.0		NR
					01	69.0	4.3	-9999.0		SM
					01	73.3	0.7	-9999.0		NR
					01	74.0	1.7	-9999.0		SM
					01	75.7	0.3	-9999.0		NR
					01	76.0	3.5	-9999.0		SM
					01	79.5	0.5	-9999.0		NR
					01	80.0	2.5	-9999.0		SM
					01	82.5	0.5	-9999.0		NR
					01	83.0	2.3	-9999.0		SM
					01	85.3	0.7	-9999.0		NR
					01	86.0	1.0	-9999.0		SM
					01	87.0	0.5	-9999.0		ML-SM
					01	87.5	1.5	-9999.0		NR
					01	89.0	2.0	-9999.0		SM
					01	91.0	1.0	-9999.0		NR
					01	92.0	3.5	-9999.0		SM
					01	95.5	2.0	-9999.0		NR
					01	97.5	1.4	-9999.0		SM
					01	98.9	3.1	-9999.0		NR
					01	102.0	2.7	-9999.0		SM
					01	104.7	1.3	-9999.0		NR
					01	106.0	0.5	-9999.0		ML
					01	106.5	3.0	-9999.0		SM
					01	109.5	1.5	-9999.0		NR
					01	111.0	1.2	-9999.0		ML
					01	112.2	8.3	-9999.0		SM
					01	120.5	0.5	-9999.0		NR
					01	121.0	0.9	-9999.0		SM
					01	121.9	0.9	-9999.0		ML
					01	122.8	2.1	-9999.0		SM
					01	124.9	1.1	-9999.0		NR
					01	126.0	0.5	-9999.0		SW
					01	126.5	1.2	-9999.0		SM
					01	127.7	2.3	-9999.0		NR

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DS8-04-SB	JM	14-mar-1990	USCS	01	130.0	2.3	-9999.0		ML
					01	132.3	3.1	-9999.0		SM
					01	135.4	0.6	-9999.0		NR
					01	136.0	0.9	-9999.0		SM
					01	136.9	0.1	-9999.0		NR
					01	137.0	4.7	-9999.0		SM
					01	141.7	0.3	-9999.0		NR
					01	142.0	1.3	-9999.0		SM
					01	143.3	0.2	-9999.0		NR
					01	143.5	4.0	-9999.0		SM
					01	147.5	0.5	-9999.0		NR
					01	148.0	1.0	-9999.0		SM
					01	149.0	0.5	-9999.0		NR
					01	149.5	2.0	-9999.0		SM
					01	151.5	3.0	-9999.0		ML
					01	154.5	3.2	-9999.0		SM
					01	157.7	0.3	-9999.0		NR
					01	158.0	2.0	-9999.0		SM
					01	160.0	0.9	-9999.0		ML
					01	160.9	0.1	-9999.0		NR
					01	161.0	3.5	-9999.0		ML
					01	164.5	1.5	-9999.0		NR
					01	166.0	4.2	-9999.0		ML
					01	170.2	0.8	-9999.0		NR
					01	171.0	2.4	-9999.0		SM
					01	173.4	2.6	-9999.0		NR
					01	176.0	3.7	-9999.0		ML
					01	179.7	0.8	-9999.0		NR
					01	180.5	4.7	-9999.0		SM
					01	185.2	0.3	-9999.0		NR
					01	185.5	2.9	-9999.0		SM
					01	188.4	0.6	-9999.0		NR
					01	189.0	2.4	-9999.0		SM
					01	191.4	1.6	-9999.0		NR
					01	193.0	9.8	-9999.0		SM
					01	202.8	0.2	-9999.0		NR
					01	203.0	6.3	-9999.0		SM
					01	209.3	0.7	-9999.0		NR
					01	210.0	13.6	-9999.0		SM
					01	223.6	0.4	-9999.0		NR
					01	224.0	2.3	-9999.0		SM
					01	226.3	0.2	-9999.0		NR
					01	226.5	4.0	-9999.0		SM
					01	230.5	0.5	-9999.0		NR
					01	231.0	1.2	-9999.0		SW
					01	232.2	0.5	-9999.0		ML
					01	232.7	3.3	-9999.0		NR
					01	236.0	2.2	-9999.0		SM
					01	238.2	2.8	-9999.0		NR
					01	241.0	4.7	-9999.0		SM
					01	245.7	0.3	-9999.0		NR

Installation: Sierra Ordnance Depot (SA)
Measurement Date Range: 01-jan-75 to 20-sep-90
Min (X,Y): (736000, 4410000) Max (X,Y): (746167, 4460707)

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DSB-04-SB	JM	14-mar-1990	USCS	01	246.0	1.3	-9999.0		SM
					01	247.3	2.7	-9999.0		NR
BORE	DSB-05-SB	JM	20-feb-1990	ADVAU	26	0.0	249.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	249.0	FT	
				GRDWT	02	-9999.0	-9999.0	80.0	FT	
				USCS	01	0.0	8.9	-9999.0		SM
					01	8.9	0.1	-9999.0		ML
					01	9.0	0.1	-9999.0		SP
					01	9.1	1.9	-9999.0		SM
					01	11.0	0.6	-9999.0		ML
					01	11.6	6.6	-9999.0		SM
					01	18.2	0.2	-9999.0		ML
					01	18.4	1.2	-9999.0		NR
					01	19.6	5.0	-9999.0		SM
					01	24.6	0.9	-9999.0		NR
					01	25.5	8.5	-9999.0		SM
					01	34.0	1.0	-9999.0		NR
					01	35.0	0.6	-9999.0		SM
					01	35.6	0.1	-9999.0		CL
					01	35.7	0.7	-9999.0		SM
					01	36.4	0.2	-9999.0		CL
					01	36.6	3.3	-9999.0		SM
					01	39.9	0.8	-9999.0		NR
					01	40.7	3.5	-9999.0		SM
					01	44.2	2.8	-9999.0		SP
					01	47.0	1.0	-9999.0		NR
					01	48.0	2.3	-9999.0		SM
					01	50.3	3.7	-9999.0		NR
					01	54.0	0.8	-9999.0		SM
					01	54.8	1.0	-9999.0		NR
					01	55.8	0.7	-9999.0		SM
					01	56.5	2.1	-9999.0		SP
					01	58.6	2.2	-9999.0		SW
					01	60.8	0.3	-9999.0		SM
					01	61.1	0.2	-9999.0		SW
					01	61.3	1.0	-9999.0		NR
					01	62.3	2.6	-9999.0		SP
					01	64.9	0.2	-9999.0		NR
					01	65.1	1.7	-9999.0		SP
					01	66.8	3.7	-9999.0		NR
					01	70.5	0.4	-9999.0		SP
					01	70.9	2.0	-9999.0		NR
					01	72.9	0.2	-9999.0		SM
					01	73.1	0.9	-9999.0		NR
					01	74.0	1.0	-9999.0		SP
					01	75.0	1.0	-9999.0		NR
					01	76.0	2.0	-9999.0		SP
					01	78.0	2.6	-9999.0		SM
					01	80.6	2.4	-9999.0		NR
					01	83.0	3.7	-9999.0		SM

Site Type/Site id	Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE DSB-05-SB	JM	20-feb-1990	USCS	01	86.7	1.0	-9999.0		NR
				01	87.7	1.1	-9999.0		SM
				01	88.8	1.0	-9999.0		NR
				01	89.8	1.7	-9999.0		SM
				01	91.5	3.8	-9999.0		SW
				01	95.3	3.5	-9999.0		SM
				01	98.8	7.0	-9999.0		NR
				01	105.8	9.8	-9999.0		SM
				01	115.6	0.2	-9999.0		NR
				01	115.8	2.5	-9999.0		SW
				01	118.3	0.2	-9999.0		CL
				01	118.5	0.4	-9999.0		SM
				01	118.9	0.8	-9999.0		SW
				01	119.7	3.5	-9999.0		NR
				01	123.2	7.6	-9999.0		SW
				01	130.8	0.2	-9999.0		NR
				01	131.0	2.3	-9999.0		SW
				01	133.3	0.3	-9999.0		ML
				01	133.6	1.9	-9999.0		NR
				01	135.5	9.8	-9999.0		SW
				01	145.3	0.2	-9999.0		NR
				01	145.5	8.8	-9999.0		SW
				01	154.3	0.2	-9999.0		NR
				01	154.5	6.0	-9999.0		SW
				01	160.5	0.6	-9999.0		NR
				01	161.1	9.9	-9999.0		SW
				01	171.0	6.5	-9999.0		SM
				01	177.5	10.5	-9999.0		SW
				01	188.0	1.0	-9999.0		NR
				01	189.0	1.2	-9999.0		SW
				01	190.2	0.8	-9999.0		NR
				01	191.0	3.0	-9999.0		SW
				01	194.0	2.0	-9999.0		NR
				01	196.0	1.0	-9999.0		SW
				01	197.0	1.0	-9999.0		NR
				01	198.0	0.5	-9999.0		SW
				01	198.5	0.5	-9999.0		SM
				01	199.0	0.4	-9999.0		SW
				01	199.4	3.6	-9999.0		SM
				01	203.0	0.3	-9999.0		SW
				01	203.3	0.7	-9999.0		NR
				01	204.0	0.3	-9999.0		SW
				01	204.3	0.7	-9999.0		NR
				01	205.0	0.3	-9999.0		SM
				01	205.3	0.6	-9999.0		SW
				01	205.9	4.1	-9999.0		NR
				01	210.0	1.5	-9999.0		SW
				01	211.5	3.5	-9999.0		NR
				01	215.0	0.3	-9999.0		SW
				01	215.3	4.7	-9999.0		NR
				01	220.0	3.0	-9999.0		SW

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DSB-05-SB	JM	20-feb-1990	USCS	01	223.0	2.0	-9999.0		NR
					01	225.0	1.5	-9999.0		SW
					01	226.5	3.5	-9999.0		NR
					01	230.0	0.4	-9999.0		SM
					01	230.4	4.5	-9999.0		NR
					01	234.9	0.2	-9999.0		SM
					01	235.1	11.9	-9999.0		NR
					01	247.0	2.0	-9999.0		SM
BORE	DSB-06-MWA	JM	05-mar-1990	ADVAU	08	0.0	73.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	73.0	FT	
				GRDWT	02	-9999.0	-9999.0	52.0	FT	
				USCS	01	0.0	7.0	-9999.0		SM
					01	7.0	33.0	-9999.0		SP
					01	40.0	10.8	-9999.0		SM
					01	50.8	0.4	-9999.0		SP
					01	51.2	3.8	-9999.0		SM
					01	55.0	0.8	-9999.0		SP
					01	55.8	17.2	-9999.0		SM
BORE	DSB-06-SB	JM	03-mar-1990	ADVAU	26	0.0	250.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	250.0	FT	
				GRDWT	02	-9999.0	-9999.0	60.0	FT	
				USCS	01	0.0	2.0	-9999.0		SP
					01	2.0	1.0	-9999.0		ML
					01	3.0	0.5	-9999.0		SM
					01	3.5	0.5	-9999.0		ML
					01	4.0	0.5	-9999.0		NR
					01	4.5	1.5	-9999.0		SP
					01	6.0	1.5	-9999.0		NR
					01	7.5	3.7	-9999.0		SP
					01	11.2	1.3	-9999.0		NR
					01	12.5	1.5	-9999.0		SP
					01	14.0	0.8	-9999.0		SW
					01	14.8	0.7	-9999.0		NR
					01	15.5	0.5	-9999.0		SP
					01	16.0	1.0	-9999.0		SW
					01	17.0	3.5	-9999.0		NR
					01	20.5	1.0	-9999.0		SW
					01	21.5	0.5	-9999.0		NR
					01	22.0	0.6	-9999.0		SM
					01	22.6	1.5	-9999.0		ML
					01	24.1	2.4	-9999.0		NR
					01	26.5	1.4	-9999.0		ML-SM
					01	27.9	0.6	-9999.0		NR
					01	28.5	2.0	-9999.0		SW
					01	30.5	0.3	-9999.0		ML
					01	30.8	2.7	-9999.0		NR
					01	33.5	0.5	-9999.0		SP
					01	34.0	1.8	-9999.0		ML-SM
					01	35.8	0.7	-9999.0		NR

Installation: Sierra Ordnance Depot (SA)
Measurement Date Range: 01-jan-75 to 20-sep-90
Min (X,Y): (736000, 4410000) Max (X,Y): (746167, 4460707)

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DSB-06-SB	JN	03-mar-1990	USCS	01	36.5	0.6	-9999.0		ML-SM
					01	37.1	0.8	-9999.0		CL
					01	37.9	0.2	-9999.0		SP
					01	38.1	1.1	-9999.0		ML-SM
					01	39.2	0.4	-9999.0		NR
					01	39.6	1.6	-9999.0		SP
					01	41.2	1.1	-9999.0		CL
					01	42.3	0.8	-9999.0		SM
					01	43.1	0.5	-9999.0		NR
					01	43.6	2.7	-9999.0		SW
					01	46.3	0.3	-9999.0		NR
					01	46.6	1.2	-9999.0		SW
					01	47.8	0.5	-9999.0		SM
					01	48.3	1.3	-9999.0		NR
					01	49.6	2.3	-9999.0		SW
					01	51.9	0.7	-9999.0		NR
					01	52.6	1.4	-9999.0		SM-ML
					01	54.0	2.5	-9999.0		NR
					01	56.5	1.0	-9999.0		ML
					01	57.5	5.2	-9999.0		CL
					01	62.7	6.8	-9999.0		SM
					01	69.5	0.5	-9999.0		SP
					01	70.0	0.5	-9999.0		NR
					01	70.5	1.5	-9999.0		SP
					01	72.0	3.0	-9999.0		ML-SM
					01	75.0	0.5	-9999.0		NR
					01	75.5	10.8	-9999.0		ML
					01	86.3	8.7	-9999.0		SW
					01	95.0	0.5	-9999.0		NR
					01	95.5	1.2	-9999.0		SM
					01	96.7	0.6	-9999.0		SW
					01	97.3	1.3	-9999.0		SM
					01	98.6	1.2	-9999.0		ML
					01	99.8	1.7	-9999.0		SM
					01	101.5	1.5	-9999.0		NR
					01	103.0	0.6	-9999.0		SM
					01	103.6	0.4	-9999.0		ML
					01	104.0	5.9	-9999.0		SM
					01	109.9	1.1	-9999.0		NR
					01	111.0	1.5	-9999.0		SM
					01	112.5	0.7	-9999.0		SM-ML
					01	113.2	2.4	-9999.0		SW
					01	115.6	0.4	-9999.0		NR
					01	116.0	2.5	-9999.0		SM
					01	118.5	0.5	-9999.0		SP
					01	119.0	1.5	-9999.0		SW
					01	120.5	0.5	-9999.0		NR
					01	121.0	2.5	-9999.0		SW
					01	123.5	2.0	-9999.0		SM
					01	125.5	0.5	-9999.0		NR
					01	126.0	2.9	-9999.0		SM

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DSB-06-SB	JM	03-mar-1990	USCS	01	128.9	1.9	-9999.0		SW
					01	130.8	0.2	-9999.0		NR
					01	131.0	1.7	-9999.0		SM
					01	132.7	2.8	-9999.0		SW
					01	135.5	0.5	-9999.0		NR
					01	136.0	4.6	-9999.0		SM
					01	140.6	0.4	-9999.0		NR
					01	141.0	11.5	-9999.0		SM
					01	152.5	0.5	-9999.0		NR
					01	153.0	3.0	-9999.0		SM
					01	156.0	1.5	-9999.0		SW
					01	157.5	0.5	-9999.0		SM
					01	158.0	1.8	-9999.0		SW
					01	159.8	1.0	-9999.0		SM
					01	160.8	0.7	-9999.0		NR
					01	161.5	1.1	-9999.0		SW
					01	162.6	1.9	-9999.0		SM
					01	164.5	3.7	-9999.0		SP
					01	168.2	1.3	-9999.0		NR
					01	169.5	1.5	-9999.0		SM
					01	171.0	0.1	-9999.0		ML
					01	171.1	3.9	-9999.0		NR
					01	175.0	5.0	-9999.0		SW
					01	180.0	0.2	-9999.0		ML
					01	180.2	3.8	-9999.0		SP
					01	184.0	1.0	-9999.0		SM
					01	185.0	1.5	-9999.0		SP
					01	186.5	0.7	-9999.0		ML
					01	187.2	0.8	-9999.0		SM
					01	188.0	0.5	-9999.0		NR
					01	188.5	4.5	-9999.0		SP
					01	193.0	2.0	-9999.0		SM
					01	195.0	0.7	-9999.0		SW
					01	195.7	0.3	-9999.0		ML
					01	196.0	0.5	-9999.0		NR
					01	196.5	0.5	-9999.0		SW
					01	197.0	7.5	-9999.0		SM
					01	204.5	1.3	-9999.0		SP
					01	205.8	0.7	-9999.0		NR
					01	206.5	0.8	-9999.0		SP
					01	207.3	2.2	-9999.0		ML
					01	209.5	0.5	-9999.0		NR
					01	210.0	7.0	-9999.0		SM
					01	217.0	9.0	-9999.0		SW
					01	226.0	0.5	-9999.0		NR
					01	226.5	6.0	-9999.0		SM
					01	232.5	1.5	-9999.0		ML
					01	234.0	2.0	-9999.0		SM
					01	236.0	4.8	-9999.0		ML
					01	240.8	0.2	-9999.0		NR
					01	241.0	3.0	-9999.0		SM

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	DSB-06-SB	JM	03-mar-1990	USCS	01	244.0	5.3	-9999.0		SW
					01	249.3	0.7	-9999.0		NR
BORE	TNT-01-MWB	JM	29-mar-1990	ADVAU	25	0.0	103.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	103.0	FT	
				GRDWT	02	-9999.0	-9999.0	60.0	FT	
				USCS	01	0.0	103.0	-9999.0		SM
BORE	TNT-01-MWC	JM	26-mar-1990	ADVAU	25	0.0	147.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	147.0	FT	
				GRDWT	02	-9999.0	-9999.0	60.0	FT	
				USCS	01	0.0	61.5	-9999.0		SM
					01	61.5	59.0	-9999.0		SP
					01	120.5	26.5	-9999.0		SW
BORE	TNT-02-MWB	JM	05-mar-1990	ADVAU	01	0.0	100.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	100.0	FT	
				GRDWT	02	-9999.0	-9999.0	61.0	FT	
				USCS	01	0.0	100.0	-9999.0		SM
BORE	TNT-02-MWC	JM	18-mar-1990	ADVAU	25	0.0	147.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	147.0	FT	
				GRDWT	02	-9999.0	-9999.0	58.0	FT	
				USCS	01	0.0	147.0	-9999.0		SM
BORE	TNT-07-MWB	JM	07-mar-1990	ADVAU	02	0.0	103.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	103.0	FT	
				GRDWT	02	-9999.0	-9999.0	54.0	FT	
				USCS	01	0.0	33.0	-9999.0		SM
					01	33.0	17.0	-9999.0		SP
					01	50.0	25.0	-9999.0		SC
					01	75.0	22.0	-9999.0		SM-SC
					01	97.0	6.0	-9999.0		SM
BORE	TNT-07-MWC	JM	20-mar-1990	ADVAU	25	0.0	147.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	147.0	FT	
				GRDWT	02	-9999.0	-9999.0	60.0	FT	
				USCS	01	0.0	147.0	-9999.0		SM
BORE	TNT-07-SB	JM	03-apr-1990	ADVAU	01	0.0	57.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	57.0	FT	
				GRDWT	02	-9999.0	-9999.0	57.0	FT	
				USCS	01	0.0	19.0	-9999.0		ML
					01	19.0	0.2	-9999.0		SP
					01	19.2	5.5	-9999.0		ML
					01	24.7	3.4	-9999.0		SM
					01	28.1	0.3	-9999.0		ML
					01	28.4	0.6	-9999.0		SM
					01	29.0	0.6	-9999.0		ML
					01	29.6	9.4	-9999.0		CL
					01	39.0	2.4	-9999.0		SP

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	TNT-07-SB	JM	03-apr-1990	USCS	01	41.4	0.4	-9999.0		SW
					01	41.8	2.2	-9999.0		ML
					01	44.0	5.0	-9999.0		SW
					01	49.0	5.0	-9999.0		SM
					01	54.0	0.6	-9999.0		SW
					01	54.6	2.4	-9999.0		SM
BORE	TNT-08-SB	JM	03-apr-1990	ADVAU	01	0.0	57.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	57.0	FT	
				GRDWT	02	-9999.0	-9999.0	55.0	FT	
				USCS	01	0.0	9.0	-9999.0		ML
					01	9.0	5.0	-9999.0		SP
					01	14.0	5.0	-9999.0		ML
					01	19.0	0.1	-9999.0		SM
					01	19.1	0.8	-9999.0		SW
					01	19.9	4.1	-9999.0		ML
					01	24.0	5.0	-9999.0		CL
					01	29.0	10.0	-9999.0		ML
					01	39.0	0.8	-9999.0		CL
					01	39.8	14.9	-9999.0		ML
					01	54.7	2.3	-9999.0		CL
BORE	TNT-09-SB	JM	03-apr-1990	ADVAU	01	0.0	55.5	-9999.0		
				DPTOT	01	-9999.0	-9999.0	55.5	FT	
				GRDWT	02	-9999.0	-9999.0	55.5	FT	
				USCS	01	0.0	14.0	-9999.0		SP
					01	14.0	1.2	-9999.0		ML
					01	15.2	3.8	-9999.0		SP
					01	19.0	10.0	-9999.0		SP
					01	29.0	5.0	-9999.0		ML
					01	34.0	5.0	-9999.0		CL
					01	39.0	5.0	-9999.0		SM
					01	44.0	10.0	-9999.0		SW
					01	54.0	1.5	-9999.0		ML
BORE	TNT-10-MWB	JM	28-mar-1990	ADVAU	02	0.0	102.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	102.0	FT	
				GRDWT	02	-9999.0	-9999.0	60.0	FT	
				USCS	01	0.0	102.0	-9999.0		SM
BORE	TNT-10-MWC	JM	16-mar-1990	ADVAU	25	0.0	143.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	143.0	FT	
				GRDWT	02	-9999.0	-9999.0	46.0	FT	
				USCS	01	0.0	23.0	-9999.0		SP
					01	23.0	5.0	-9999.0		SM
					01	28.0	21.0	-9999.0		SP
					01	49.0	11.0	-9999.0		SM
					01	60.0	41.0	-9999.0		ML
					01	101.0	4.0	-9999.0		ML-SM
					01	105.0	38.0	-9999.0		SM

Installation: Sierra Ordnance Depot (SA)
Measurement Date Range: 01-jan-75 to 20-sep-90
Min (X,Y): (736000, 4410000) Max (X,Y): (746167, 4460707)

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	TNT-10-SB	JM	02-apr-1990	ADVAU	01	0.0	50.5	-9999.0		
				DPTOT	01	-9999.0	-9999.0	50.5	FT	
				GRDWT	02	-9999.0	-9999.0	50.5	FT	
				USCS	01	0.0	9.0	-9999.0		ML
					01	9.0	5.0	-9999.0		SM
					01	14.0	5.0	-9999.0		ML
					01	19.0	5.0	-9999.0		SP
					01	24.0	5.0	-9999.0		SW-SM
					01	29.0	10.0	-9999.0		CL
					01	39.0	0.8	-9999.0		SW
					01	39.8	9.2	-9999.0		ML
					01	49.0	1.2	-9999.0		CL
					01	50.2	0.3	-9999.0		ML
BORE	TNT-11-SB	JM	02-apr-1990	ADVAU	01	0.0	50.5	-9999.0		
				DPTOT	01	-9999.0	-9999.0	50.5	FT	
				GRDWT	02	-9999.0	-9999.0	50.0	FT	
				USCS	01	0.0	14.0	-9999.0		SP
					01	14.0	1.0	-9999.0		ML
					01	15.0	10.5	-9999.0		SM
					01	25.5	1.1	-9999.0		SW
					01	26.6	0.2	-9999.0		ML
					01	26.8	2.2	-9999.0		SM
					01	29.0	1.2	-9999.0		SW
					01	30.2	3.8	-9999.0		SM
					01	34.0	0.8	-9999.0		ML
					01	34.8	0.2	-9999.0		SM
					01	35.0	0.3	-9999.0		ML
					01	35.3	3.7	-9999.0		CL
					01	39.0	0.8	-9999.0		SW
					01	39.8	5.3	-9999.0		ML
					01	45.1	3.9	-9999.0		SW-SM
					01	49.0	1.5	-9999.0		SM
BORE	TNT-12-SB	JM	04-apr-1990	ADVAU	01	0.0	50.5	-9999.0		
				DPTOT	01	-9999.0	-9999.0	50.5	FT	
				GRDWT	02	-9999.0	-9999.0	48.5	FT	
				USCS	01	0.0	9.0	-9999.0		ML
					01	9.0	1.2	-9999.0		SW
					01	10.2	3.8	-9999.0		SM
					01	14.0	5.8	-9999.0		SW
					01	19.8	4.2	-9999.0		SM
					01	24.0	1.4	-9999.0		CL
					01	25.4	0.4	-9999.0		ML
					01	25.8	3.2	-9999.0		SW
					01	29.0	5.0	-9999.0		SM
					01	34.0	5.0	-9999.0		ML
					01	39.0	5.0	-9999.0		CL
					01	44.0	6.5	-9999.0		SM
BORE	TNT-13-SB	JM	05-apr-1990	ADVAU	01	0.0	50.5	-9999.0		

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	TNT-13-SB	JM	05-apr-1990	DPTOT	01	-9999.0	-9999.0	50.5	FT	
				GRDWT	02	-9999.0	-9999.0	50.0	FT	
				USCS	01	0.0	14.0	-9999.0		ML
					01	14.0	10.0	-9999.0		SP
					01	24.0	1.3	-9999.0		CL
					01	25.3	0.2	-9999.0		SW
					01	25.5	3.5	-9999.0		CL
					01	29.0	5.0	-9999.0		SW-SM
					01	34.0	16.5	-9999.0		ML
BORE	TNT-14-SB	JM	09-apr-1990	ADVAU	01	0.0	51.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	51.0	FT	
				GRDWT	02	-9999.0	-9999.0	51.0	FT	
				USCS	01	0.0	9.0	-9999.0		SP
					01	9.0	5.0	-9999.0		ML
					01	14.0	5.0	-9999.0		SW-SM
					01	19.0	0.6	-9999.0		SW
					01	19.6	4.4	-9999.0		SM
					01	24.0	0.4	-9999.0		ML
					01	24.4	1.4	-9999.0		SW
					01	25.8	3.2	-9999.0		SM
					01	29.0	5.0	-9999.0		SW
					01	34.0	5.0	-9999.0		CL
					01	39.0	1.5	-9999.0		ML
					01	40.5	3.5	-9999.0		CL
					01	44.0	5.0	-9999.0		ML-CL
					01	49.0	2.0	-9999.0		SW
BORE	TNT-15-MWA	JM	27-feb-1990	ADVAU	02	0.0	71.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	71.0	FT	
				GRDWT	02	-9999.0	-9999.0	54.0	FT	
				USCS	01	0.0	15.3	-9999.0		SP
					01	15.3	4.7	-9999.0		SM
					01	20.0	10.0	-9999.0		SP
					01	30.0	6.0	-9999.0		ML
					01	36.0	4.0	-9999.0		SP
					01	40.0	0.5	-9999.0		SM
					01	40.5	5.2	-9999.0		SP
					01	45.7	4.3	-9999.0		SC
					01	50.0	10.0	-9999.0		SP
					01	60.0	10.0	-9999.0		ML
					01	70.0	1.0	-9999.0		SP
BORE	TNT-15-SB	JM	05-apr-1990	ADVAU	01	0.0	50.5	-9999.0		
				DPTOT	01	-9999.0	-9999.0	50.5	FT	
				GRDWT	02	-9999.0	-9999.0	50.0	FT	
				USCS	01	0.0	14.0	-9999.0		SP
					01	14.0	0.8	-9999.0		CL
					01	14.8	9.2	-9999.0		ML
					01	24.0	5.0	-9999.0		CL
					01	29.0	5.0	-9999.0		SW

Site Type	Site id	Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	TNT-15-SB	JM	05-apr-1990	USCS	01	34.0	5.0	-9999.0		CL
					01	39.0	5.0	-9999.0		ML
					01	44.0	5.0	-9999.0		CL
					01	49.0	1.5	-9999.0		SM
BORE	TNT-16-MWA	JM	28-feb-1990	ADVAU	02	0.0	72.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	72.0	FT	
				GRDWT	02	-9999.0	-9999.0	55.0	FT	
				USCS	01	0.0	19.5	-9999.0		SP
					01	19.5	0.7	-9999.0		SM
					01	20.2	5.4	-9999.0		SP
					01	25.6	3.9	-9999.0		SM
					01	29.5	0.6	-9999.0		SC
					01	30.1	4.7	-9999.0		ML
					01	34.8	0.4	-9999.0		SP
					01	35.2	4.3	-9999.0		ML
					01	39.5	0.2	-9999.0		SM
					01	39.7	0.3	-9999.0		SP
					01	40.0	0.5	-9999.0		ML
					01	40.5	4.0	-9999.0		SP
					01	44.5	0.8	-9999.0		SM
					01	45.3	14.2	-9999.0		CL
					01	59.5	1.5	-9999.0		SP
					01	61.0	11.0	-9999.0		SM
BORE	TNT-16-SB	JM	10-apr-1990	ADVAU	01	0.0	50.5	-9999.0		
				DPTOT	01	-9999.0	-9999.0	50.5	FT	
				NOGWT	01	-9999.0	-9999.0	-9999.0		
				USCS	01	0.0	26.4	-9999.0		ML
					01	26.4	2.6	-9999.0		CL
					01	29.0	1.5	-9999.0		ML
					01	30.5	3.5	-9999.0		SM-CL
					01	34.0	5.3	-9999.0		ML
					01	39.3	0.3	-9999.0		SM
					01	39.6	4.4	-9999.0		ML
					01	44.0	0.7	-9999.0		SM
					01	44.7	5.8	-9999.0		ML
BORE	TNT-17-SB	JM	09-apr-1990	ADVAU	01	0.0	51.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	51.0	FT	
				GRDWT	02	-9999.0	-9999.0	51.0	FT	
				USCS	01	0.0	9.0	-9999.0		SP
					01	9.0	5.0	-9999.0		ML
					01	14.0	5.0	-9999.0		SW
					01	19.0	5.0	-9999.0		ML
					01	24.0	5.0	-9999.0		ML-CL
					01	29.0	5.0	-9999.0		SW
					01	34.0	10.0	-9999.0		ML
					01	44.0	5.0	-9999.0		SM
					01	49.0	0.9	-9999.0		SW
					01	49.9	1.1	-9999.0		ML

Installation: Sierra Ordnance Depot (SA)
Measurement Date Range: 01-jan-75 to 20-sep-90
Min (X,Y): (736000, 4410000) Max (X,Y): (746167, 4460707)

Site Type	Site id	Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
BORE	TNT-18-SB	JM	09-apr-1990	ADVAU	01	0.0	51.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	51.0	FT	
				GRDWT	02	-9999.0	-9999.0	51.0	FT	
				USCS	01	0.0	9.0	-9999.0		SP
					01	9.0	5.0	-9999.0		ML
					01	14.0	5.0	-9999.0		SP
					01	19.0	10.0	-9999.0		ML
					01	29.0	1.5	-9999.0		SM-ML
					01	30.5	0.6	-9999.0		NR
					01	31.1	4.1	-9999.0		ML
					01	35.2	3.8	-9999.0		CL
					01	39.0	0.5	-9999.0		ML
					01	39.5	4.5	-9999.0		CL
					01	44.0	0.6	-9999.0		ML
					01	44.6	0.6	-9999.0		CL
					01	45.2	5.8	-9999.0		ML
BORE	TNT-19-SB	JM	10-apr-1990	ADVAU	01	0.0	51.0	-9999.0		
				DPTOT	01	-9999.0	-9999.0	51.0	FT	
				GRDWT	02	-9999.0	-9999.0	51.0	FT	
				USCS	01	0.0	30.5	-9999.0		ML
					01	30.5	0.8	-9999.0		NR
					01	31.3	2.7	-9999.0		SM
					01	34.0	5.8	-9999.0		ML
					01	39.8	4.2	-9999.0		CL
					01	44.0	5.0	-9999.0		ML-CL
					01	49.0	2.0	-9999.0		ML

Well Construction Data from the GWC File of the IRDMS

JMM James M. Montgomery
Consulting Engineers Inc.

GEOTECHNICAL WELL CONSTRUCTION (GWC) REPORT
Installation: Sierra Ordnance Depot (SA)
Measurement Date Range: 1/1/75 to 7-aug-90
Min (X,Y): (736000, 4441000) Max (X,Y): (746167, 4460707)

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
WELL	ALF-01-MWA	JM	15-feb-1990	BSEAL	01	72.0	8.0	-9999.0		SMH
				CASE	01	-9999.0	-9999.0	85.0	FT	SMH
				CASED	01	-9999.0	-9999.0	0.3	FT	SMH
				DPTOT	01	-9999.0	-9999.0	105.0	FT	SMH
				GFILT	01	80.0	25.0	-9999.0		SMH
				GROUT	04	2.0	70.0	-9999.0		SMH
				SCREN	02	85.0	19.5	-9999.0		SMH
				STKUP	01	-9999.0	-9999.0	0.9	FT	SMH
WELL	ALF-02-MWA	JM	18-feb-1990	BSEAL	01	77.0	4.5	-9999.0		SMH
				CASE	01	-9999.0	-9999.0	87.0	FT	SMH
				CASED	01	-9999.0	-9999.0	0.3	FT	SMH
				DPTOT	01	-9999.0	-9999.0	107.0	FT	SMH
				GFILT	01	81.5	25.5	-9999.0		SMH
				GROUT	04	2.0	75.0	-9999.0		SMH
				SCREN	02	87.0	19.8	-9999.0		SMH
				STKUP	01	-9999.0	-9999.0	1.8	FT	SMH
WELL	ALF-03-MWA	JM	19-feb-1990	BSEAL	01	75.5	5.0	-9999.0		SMH
				CASE	01	-9999.0	-9999.0	86.0	FT	SMH
				CASED	01	-9999.0	-9999.0	0.3	FT	SMH
				DPTOT	01	-9999.0	-9999.0	106.0	FT	SMH
				GFILT	01	86.0	20.0	-9999.0		SMH
				GROUT	04	2.0	73.5	-9999.0		SMH
				SCREN	02	86.0	19.8	-9999.0		SMH
				STKUP	01	-9999.0	-9999.0	2.0	FT	SMH
WELL	CCB-01-MWA	JM	21-feb-1990	BSEAL	01	60.2	5.3	-9999.0		SMH
				CASE	01	-9999.0	-9999.0	71.0	FT	SMH
				CASED	01	-9999.0	-9999.0	0.3	FT	SMH
				DPTOT	01	-9999.0	-9999.0	91.5	FT	SMH
				GFILT	01	65.5	26.0	-9999.0		SMH
				GROUT	04	2.0	58.2	-9999.0		SMH
				SCREN	02	71.0	19.0	-9999.0		SMH
				STKUP	01	-9999.0	-9999.0	2.2	FT	SMH
WELL	CCB-02-MWA	JM	26-feb-1990	BSEAL	01	72.0	5.0	-9999.0		SMH
				CASE	01	-9999.0	-9999.0	83.0	FT	SMH
				CASED	01	-9999.0	-9999.0	0.3	FT	SMH
				DPTOT	01	-9999.0	-9999.0	104.0	FT	SMH
				GFILT	01	77.0	27.0	-9999.0		SMH
				GROUT	04	2.0	70.0	-9999.0		SMH
				SCREN	02	83.0	20.8	-9999.0		SMH
				STKUP	01	-9999.0	-9999.0	1.1	FT	SMH
WELL	DMO-03-MWA	JM	27-feb-1990	BSEAL	01	77.0	5.6	-9999.0		SMH
				CASE	01	-9999.0	-9999.0	86.7	FT	SMH
				CASED	01	-9999.0	-9999.0	0.3	FT	SMH
				DPTOT	01	-9999.0	-9999.0	109.0	FT	SMH

Installation: Sierra Ordnance Depot (SA)
Measurement Date Range: 1/1/75 to 7-aug-90
Min (X,Y): (736000, 4441000) Max (X,Y): (746167, 4460707)

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
WELL	DMO-03-MWA	JM	27-feb-1990	GFILT	01	82.6	26.4	-9999.0		SMH
				GROUT	04	2.0	75.0	-9999.0		SMH
				SCREN	02	86.7	20.0	-9999.0		SMH
				STKUP	01	-9999.0	-9999.0	1.3	FT	SMH
WELL	DMO-04-MWA	JM	04-mar-1990	BSEAL	01	77.5	5.5	-9999.0		SMH
				CASE	01	-9999.0	-9999.0	88.8	FT	SMH
				CASED	01	-9999.0	-9999.0	0.3	FT	SMH
				DPTOT	01	-9999.0	-9999.0	109.0	FT	SMH
				GFILT	01	83.0	26.0	-9999.0		SMH
				GROUT	04	2.0	75.5	-9999.0		SMH
				SCREN	02	88.8	20.0	-9999.0		SMH
				STKUP	01	-9999.0	-9999.0	1.4	FT	SMH
WELL	DMO-05-MWA	JM	28-feb-1990	BSEAL	01	77.0	6.4	-9999.0		SMH
				CASE	01	-9999.0	-9999.0	89.6	FT	SMH
				CASED	01	-9999.0	-9999.0	0.3	FT	SMH
				DPTOT	01	-9999.0	-9999.0	110.0	FT	SMH
				GFILT	01	83.4	26.6	-9999.0		SMH
				GROUT	04	2.0	75.0	-9999.0		SMH
				SCREN	02	89.6	20.0	-9999.0		SMH
				STKUP	01	-9999.0	-9999.0	1.2	FT	SMH
WELL	DSB-01-MWA	JM	03-mar-1990	BSEAL	01	16.0	5.0	-9999.0		JSB
				CASE	01	-9999.0	-9999.0	27.0	FT	JSB
				CASED	01	-9999.0	-9999.0	0.2	FT	JSB
				DPTOT	01	-9999.0	-9999.0	33.0	FT	JSB
				GFILT	01	21.0	11.0	-9999.0		JSB
				GROUT	04	2.0	14.0	-9999.0		JSB
				SCREN	01	27.0	5.0	-9999.0		JSB
				STKUP	01	-9999.0	-9999.0	2.3	FT	JSB
WELL	DSB-02-MWA	JM	04-mar-1990	BSEAL	01	25.0	5.0	-9999.0		JSB
				CASE	01	-9999.0	-9999.0	35.0	FT	JSB
				CASED	01	-9999.0	-9999.0	0.2	FT	JSB
				DPTOT	01	-9999.0	-9999.0	41.5	FT	JSB
				GFILT	01	30.0	10.0	-9999.0		JSB
				GROUT	04	2.0	23.0	-9999.0		JSB
				SCREN	01	35.0	5.0	-9999.0		JSB
				STKUP	01	-9999.0	-9999.0	2.0	FT	JSB
WELL	DSB-04-MWA	JM	05-mar-1990	BSEAL	01	10.0	5.0	-9999.0		JSB
				CASE	01	-9999.0	-9999.0	20.0	FT	JSB
				CASED	01	-9999.0	-9999.0	0.2	FT	JSB
				DPTOT	01	-9999.0	-9999.0	45.0	FT	JSB
				GFILT	01	15.0	25.0	-9999.0		JSB
				GROUT	04	2.0	8.0	-9999.0		JSB
				SCREN	01	20.0	20.0	-9999.0		JSB
				STKUP	01	-9999.0	-9999.0	2.0	FT	JSB
WELL	DSB-06-MWA	JM	05-mar-1990	BSEAL	01	55.0	5.0	-9999.0		SMH

GEOTECHNICAL WELL CONSTRUCTION (GWC)
Installation: Sierra Ordnance Depot (SA)
Measurement Date Range: 1/1/75 to 7-aug-90
Min (X,Y): (736000, 4441000) Max (X,Y): (746167, 4460707)

Site Type	Site id	Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
WELL	DSB-06-MWA	JM	05-mar-1990	CASE	01	-9999.0	-9999.0	66.0	FT	SMH
				CASED	01	-9999.0	-9999.0	0.2	FT	SMH
				DPTOT	01	-9999.0	-9999.0	73.0	FT	SMH
				GFILT	01	60.0	13.0	-9999.0		SMH
				GROUT	04	2.0	53.0	-9999.0		SMH
				SCREN	01	66.0	5.0	-9999.0		SMH
				STKUP	01	-9999.0	-9999.0	2.0	FT	SMH
WELL	TNT-01-MWB	JM	29-mar-1990	BSEAL	01	80.0	5.0	-9999.0		DXM
				CASE	01	-9999.0	-9999.0	90.0	FT	DXM
				CASED	01	-9999.0	-9999.0	0.3	FT	DXM
				DPTOT	01	-9999.0	-9999.0	103.0	FT	DXM
				GFILT	01	85.0	18.0	-9999.0		DXM
				GROUT	04	2.0	78.0	-9999.0		DXM
				SCREN	02	90.0	10.0	-9999.0		DXM
				STKUP	01	-9999.0	-9999.0	3.2	FT	DXM
WELL	TNT-01-MWC	JM	27-mar-1990	BSEAL	01	118.0	5.0	-9999.0		DXM
				CASE	01	-9999.0	-9999.0	128.0	FT	DXM
				CASED	01	-9999.0	-9999.0	0.3	FT	DXM
				DPTOT	01	-9999.0	-9999.0	147.0	FT	DXM
				GFILT	01	123.0	24.0	-9999.0		DXM
				GROUT	04	2.0	116.0	-9999.0		DXM
				SCREN	02	128.0	10.0	-9999.0		DXM
				STKUP	01	-9999.0	-9999.0	2.2	FT	DXM
WELL	TNT-02-MWB	JM	06-mar-1990	BSEAL	01	75.0	10.0	-9999.0		JSB
				CASE	01	-9999.0	-9999.0	90.0	FT	JSB
				CASED	01	-9999.0	-9999.0	0.3	FT	JSB
				DPTOT	01	-9999.0	-9999.0	102.0	FT	JSB
				GFILT	01	85.0	15.0	-9999.0		JSB
				GROUT	04	2.0	73.0	-9999.0		JSB
				SCREN	02	90.0	10.0	-9999.0		JSB
				STKUP	01	-9999.0	-9999.0	1.8	FT	JSB
WELL	TNT-02-MWC	JM	19-mar-1990	BSEAL	01	120.0	5.0	-9999.0		JSB
				CASE	01	-9999.0	-9999.0	130.0	FT	JSB
				CASED	01	-9999.0	-9999.0	0.3	FT	JSB
				DPTOT	01	-9999.0	-9999.0	143.0	FT	JSB
				GFILT	01	125.0	18.0	-9999.0		JSB
				GROUT	04	2.0	118.0	-9999.0		JSB
				SCREN	02	130.0	10.0	-9999.0		JSB
				STKUP	01	-9999.0	-9999.0	3.0	FT	JSB
WELL	TNT-07-MWB	JM	12-mar-1990	BSEAL	01	82.0	5.0	-9999.0		SMH
				CASE	01	-9999.0	-9999.0	92.0	FT	SMH
				CASED	01	-9999.0	-9999.0	0.3	FT	SMH
				DPTOT	01	-9999.0	-9999.0	104.0	FT	SMH
				GFILT	01	87.0	17.0	-9999.0		SMH
				GROUT	04	2.0	80.0	-9999.0		SMH
				SCREN	02	92.0	10.0	-9999.0		SMH

Site Type/Site id		Org	Measurement Date	Action Measurement	Method	Depth	Interval	Value	Unit Meas.	Entry
WELL	TNT-07-MWB	JM	12-mar-1990	STKUP	01	-9999.0	-9999.0	2.4	FT	SMH
WELL	TNT-07-MWC	JM	21-mar-1990	BSEAL	01	120.0	5.0	-9999.0		DXM
				CASE	01	-9999.0	-9999.0	130.0	FT	DXM
				CASED	01	-9999.0	-9999.0	0.3	FT	DXM
				DPTOT	01	-9999.0	-9999.0	147.0	FT	DXM
				GFILT	01	120.0	10.0	-9999.0		DXM
				GROUT	04	2.0	118.0	-9999.0		DXM
				SCREEN	02	130.0	10.0	-9999.0		DXM
				STKUP	01	-9999.0	-9999.0	3.0	FT	DXM
WELL	TNT-10-MWB	JM	28-mar-1990	BSEAL	01	80.0	5.0	-9999.0		DXM
				CASE	01	-9999.0	-9999.0	90.0	FT	DXM
				CASED	01	-9999.0	-9999.0	0.3	FT	DXM
				DPTOT	01	-9999.0	-9999.0	102.0	FT	DXM
				GFILT	01	85.0	17.0	-9999.0		DXM
				GROUT	04	2.0	78.0	-9999.0		DXM
				SCREEN	02	90.0	10.0	-9999.0		DXM
				STKUP	01	-9999.0	-9999.0	2.3	FT	DXM
WELL	TNT-10-MWC	JM	17-mar-1990	BSEAL	01	115.0	5.0	-9999.0		DXM
				CASE	01	-9999.0	-9999.0	125.0	FT	DXM
				CASED	01	-9999.0	-9999.0	0.3	FT	DXM
				DPTOT	01	-9999.0	-9999.0	146.0	FT	DXM
				GFILT	01	120.0	26.0	-9999.0		DXM
				GROUT	04	2.0	113.0	-9999.0		DXM
				SCREEN	02	125.0	10.0	-9999.0		DXM
				STKUP	01	-9999.0	-9999.0	2.9	FT	DXM
WELL	TNT-15-MWA	JM	03-mar-1990	BSEAL	01	40.9	4.8	-9999.0		JSB
				CASE	01	-9999.0	-9999.0	50.0	FT	JSB
				CASED	01	-9999.0	-9999.0	0.3	FT	JSB
				DPTOT	01	-9999.0	-9999.0	74.0	FT	JSB
				GFILT	01	45.7	28.3	-9999.0		JSB
				GROUT	04	2.0	38.9	-9999.0		JSB
				SCREEN	02	50.0	20.0	-9999.0		JSB
				STKUP	01	-9999.0	-9999.0	2.4	FT	JSB
WELL	TNT-16-MWA	JM	28-feb-1990	BSEAL	01	41.5	5.0	-9999.0		JSB
				CASE	01	-9999.0	-9999.0	51.0	FT	JSB
				CASED	01	-9999.0	-9999.0	0.3	FT	JSB
				DPTOT	01	-9999.0	-9999.0	72.0	FT	JSB
				GFILT	01	46.5	25.5	-9999.0		JSB
				GROUT	04	2.0	39.5	-9999.0		JSB
				SCREEN	02	51.0	20.0	-9999.0		JSB
				STKUP	01	-9999.0	-9999.0	1.8	FT	JSB

Groundwater Stabilized Elevation Data from the GGS File of the IRDMS

JMM James M. Montgomery
Consulting Engineers Inc.

GROUND WATER STABILIZED REPORT
Sun Sep 9 14:03:52 1990

For Parameters :

Installation = Sierra Ordnance Depot
Beginning Date = 01/01/75
Ending Date = 09/07/90

GROUND WATER STABILIZED REPORT

INSTALLATION: Sierra Ordnance Depot

WELL NUMBER	AQFR NAME	SAMPLING DATE	ORG	SURFACE ELEV(FT)	DEPTH FROM GR SUR(FT)	STABILIZED ELEV(FT)
ALF-01-MWA		16-apr-1990	JM	4079.1	90.4	3988.7
		31-may-1990	JM		90.9	3988.2
ALF-02-MWA		16-apr-1990	JM	4076.7	85.5	3991.2
		01-jun-1990	JM		86.2	3990.5
ALF-03-MWA		16-apr-1990	JM	4085.4	83.3	4002.1
		01-jun-1990	JM		93.8	3991.6
CCB-01-MWA		16-apr-1990	JM	4065.6	77.1	3988.5
		01-jun-1990	JM		77.5	3988.1
CCB-02-MWA		16-apr-1990	JM	4074.6	85.3	3989.3
		02-jun-1990	JM		85.9	3988.7
DMO-03-MWA		19-apr-1990	JM	4084.1	94.8	3989.3
		31-may-1990	JM		95.0	3989.1
DMO-04-MWA		19-apr-1990	JM	4084.0	95.0	3989.0
		31-may-1990	JM		95.1	3988.9
DMO-05-MWA		19-apr-1990	JM	4083.1	94.1	3989.0
		31-may-1990	JM		94.3	3988.8
DSB-01-MWA		16-apr-1990	JM	3994.0	12.0	3982.0
		07-jun-1990	JM		12.1	3981.9
DSB-02-MWA		16-apr-1990	JM	4000.1	18.1	3982.0
		07-jun-1990	JM		18.2	3981.9
DSB-04-MWA		16-apr-1990	JM	4007.3	22.9	3984.4
		08-jun-1990	JM		22.7	3984.6
TNT-01-MWA		17-apr-1990	JM	4042.0	55.4	3986.6
		05-jun-1990	JM		55.6	3986.4
TNT-01-MWB		17-apr-1990	JM	4042.2	56.0	3986.2
		05-jun-1990	JM		56.4	3985.8
TNT-01-MWC		17-apr-1990	JM	4042.0	55.9	3986.1
		05-jun-1990	JM		56.3	3985.7
TNT-02-MWA		17-apr-1990	JM	4041.0	54.3	3986.7
		04-jun-1990	JM		54.6	3986.4
TNT-02-MWB		17-apr-1990	JM	4041.2	54.6	3986.6
		04-jun-1990	JM		54.9	3986.3
TNT-02-MWC		17-apr-1990	JM	4040.2	54.0	3986.2
		04-jun-1990	JM		54.3	3985.9
TNT-03-MWA		19-apr-1990	JM	4039.4	52.7	3986.7
		08-jun-1990	JM		52.9	3986.5
TNT-04-MWA		17-apr-1990	JM	4040.6	53.7	3986.9
		08-jun-1990	JM		53.9	3986.7
TNT-05-MWA		25-apr-1990	JM	4045.4	58.5	3986.9
		07-jun-1990	JM		58.6	3986.8
TNT-06-MWA		17-apr-1990	JM	4041.4	54.6	3986.8
		06-jun-1990	JM		54.9	3986.5
TNT-07-MWA		19-apr-1990	JM	4042.7	56.1	3986.6
		06-jun-1990	JM		56.4	3986.3
TNT-07-MWB		17-apr-1990	JM	4042.4	56.0	3986.4
		06-jun-1990	JM		56.3	3986.1
TNT-07-MWC		17-apr-1990	JM	4042.1	56.0	3986.1
		06-jun-1990	JM		56.4	3985.7
TNT-08-MWA		17-apr-1990	JM	4042.4	55.3	3987.1
		07-jun-1990	JM		55.5	3986.9

GROUND WATER STABILIZED REPORT

INSTALLATION: Sierra Ordnance Depot

WELL NUMBER	AQFR NAME	SAMPLING DATE	ORG	SURFACE ELEV(FT)	DEPTH FROM GR SUR(FT)	STABILIZED ELEV(FT)
TNT-09-MWA		19-apr-1990	JM	4042.3	55.0	3987.3
		06-jun-1990	JM		55.0	3987.3
TNT-10-MWA		16-apr-1990	JM	4043.0	56.0	3987.0
		03-jun-1990	JM		56.3	3986.7
TNT-10-MWB		16-apr-1990	JM	4043.0	56.8	3986.2
		03-jun-1990	JM		57.2	3985.8
TNT-10-MWC		16-apr-1990	JM	4041.8	55.9	3985.9
		03-jun-1990	JM		56.3	3985.5
TNT-11-MWA		19-apr-1990	JM	4046.3	59.2	3987.1
		07-jun-1990	JM		59.5	3986.8
TNT-12-MWA		25-apr-1990	JM	4037.0	50.3	3986.7
		07-jun-1990	JM		50.6	3986.4
TNT-13-MWA		25-apr-1990	JM	4043.2	52.2	3991.0
		07-jun-1990	JM		56.3	3986.9
TNT-14-MWA		2[illegible]-apr-1990	JM	4035.9	49.5	3986.4
		03-jun-1990	JM		48.8	3987.1
TNT-15-MWA		19-apr-1990	JM	4037.2	52.0	3985.2
		02-jun-1990	JM		52.2	3985.0
TNT-16-MWA		17-apr-1990	JM	4043.1	56.7	3986.4
		02-jun-1990	JM		57.0	3986.1

Program ended normally.$

Chemical Groundwater Data (for detects only) from the CGW File of the IRDMS

JMM James M. Montgomery
Consulting Engineers Inc.

INSTALLATION RESTORATION PROGRAM

CHEMICAL REPORT

Tue Jan 22 16:04:46 1991

For Parameters :

Installation = Sierra Ordnance Depot

Beginning Date = 01-jan-75

Ending Date = 22-jan-91

Media Type = Chemical Ground Water (CGW)

Maximum (X, Y) = (746811, 4460743)

Minimum (X, Y) = (736000, 4441000)

Booleans = N

Jan 22, 1991 Installation: Sierra Ordnance Depot Page 1
Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL ALF-01-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
90.4	17-apr-1990	99	TDS		762000.000	UGL
90.4	31-may-1990	99	TDS		900000.000	UGL
90.4	31-may-1990	99	TDS		884000.000	UGL
90.4	17-apr-1990	SB01	HG		0.488	UGL
90.4	31-may-1990	SD20	PB		2.600	UGL
90.4	31-may-1990	SD20	PB		2.930	UGL
90.4	17-apr-1990	SD21	SE		16.300	UGL
90.4	31-may-1990	SD21	SE		18.600	UGL
90.4	31-may-1990	SD21	SE		18.300	UGL
90.4	17-apr-1990	SD22	AS		3.730	UGL
90.4	31-may-1990	SD22	AS		3.410	UGL
90.4	17-apr-1990	SS10	BA		19.900	UGL
90.4	31-may-1990	SS10	BA		19.900	UGL
90.4	31-may-1990	SS10	BA		20.200	UGL
90.4	17-apr-1990	SS10	CA		110000.000	UGL
90.4	31-may-1990	SS10	CA		120000.000	UGL
90.4	31-may-1990	SS10	CA		110000.000	UGL
90.4	17-apr-1990	SS10	CU		8.710	UGL
90.4	17-apr-1990	SS10	NA		50500.000	UGL
90.4	31-may-1990	SS10	NA		50900.000	UGL
90.4	31-may-1990	SS10	NA		53000.000	UGL
90.4	17-apr-1990	SS10	ZN		62.500	UGL
90.4	17-apr-1990	TT10	CL		100000.000	UGL
90.4	31-may-1990	TT10	CL		100000.000	UGL
90.4	31-may-1990	TT10	CL		100000.000	UGL
90.4	17-apr-1990	TT10	SO4		300000.000	UGL
90.4	31-may-1990	TT10	SO4		320000.000	UGL
90.4	31-may-1990	TT10	SO4		310000.000	UGL
90.4	17-apr-1990	UN18	UNK600		10.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL ALF-02-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
85.5	17-apr-1990	99	TDS		4060000.000	UGL
85.5	01-jun-1990	99	TDS		1100000.000	UGL
85.5	01-jun-1990	SD20	PB		2.170	UGL
85.5	17-apr-1990	SD21	SE		6.070	UGL
85.5	01-jun-1990	SD21	SE		6.790	UGL
85.5	17-apr-1990	SD22	AS		7.460	UGL
85.5	01-jun-1990	SD22	AS		6.720	UGL
85.5	17-apr-1990	SS10	BA		16.200	UGL
85.5	01-jun-1990	SS10	BA		16.100	UGL
85.5	17-apr-1990	SS10	CA		130000.000	UGL
85.5	01-jun-1990	SS10	CA		130000.000	UGL
85.5	17-apr-1990	SS10	NA		78000.000	UGL
85.5	01-jun-1990	SS10	NA		130000.000	UGL
85.5	17-apr-1990	SS10	ZN		38.000	UGL
85.5	01-jun-1990	TF18	CYN		3.310	UGL
85.5	17-apr-1990	TT10	CL		67000.000	UGL
85.5	01-jun-1990	TT10	CL		66000.000	UGL
85.5	17-apr-1990	TT10	SO4		450000.000	UGL
85.5	01-jun-1990	TT10	SO4		440000.000	UGL
85.5	17-apr-1990	UM18	UNK576		5.000	UGL
85.5	17-apr-1990	UM18	UNK600		5.000	UGL
85.5	01-jun-1990	UM20	12DCE		0.621	UGL
85.5	17-apr-1990	UM20	TRCLE		41.000	UGL
85.5	01-jun-1990	UM20	TRCLE		70.500	UGL

Site: WELL ALF-03-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
83.3	17-apr-1990	99	TDS		1250000.000	UGL
83.3	17-apr-1990	99	TDS		1300000.000	UGL
83.3	01-jun-1990	99	TDS		1250000.000	UGL
83.3	01-jun-1990	SD20	PB		3.360	UGL
83.3	17-apr-1990	SD21	SE		14.900	UGL
83.3	17-apr-1990	SD21	SE		15.300	UGL
83.3	01-jun-1990	SD21	SE		16.600	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL ALF-03-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
83.3	17-apr-1990	SD22	AS		3.940	UGL
83.3	17-apr-1990	SD22	AS		4.800	UGL
83.3	01-jun-1990	SD22	AS		4.160	UGL
83.3	17-apr-1990	SS10	BA		53.500	UGL
83.3	17-apr-1990	SS10	BA		54.700	UGL
83.3	01-jun-1990	SS10	BA		52.300	UGL
83.3	17-apr-1990	SS10	CA		200000.000	UGL
83.3	17-apr-1990	SS10	CA		180000.000	UGL
83.3	01-jun-1990	SS10	CA		170000.000	UGL
83.3	17-apr-1990	SS10	NA		49200.000	UGL
83.3	17-apr-1990	SS10	NA		48000.000	UGL
83.3	01-jun-1990	SS10	NA		57000.000	UGL
83.3	17-apr-1990	SS10	ZN		47.200	UGL
83.3	17-apr-1990	SS10	ZN		43.100	UGL
83.3	17-apr-1990	TT10	CL		270000.000	UGL
83.3	01-jun-1990	TT10	CL		270000.000	UGL
83.3	17-apr-1990	TT10	SO4		260000.000	UGL
83.3	01-jun-1990	TT10	SO4		260000.000	UGL
83.3	01-jun-1990	UM18	B2EHP		6.090	UGL
83.3	01-jun-1990	UM18	TCLEA		9.000	UGL
83.3	17-apr-1990	UM18	UNK600		4.000	UGL
83.3	17-apr-1990	UM18	UNK600		5.000	UGL
83.3	17-apr-1990	UM18	UNK648		9.000	UGL
83.3	17-apr-1990	UM20	CHCL3		1.130	UGL
83.3	17-apr-1990	UM20	CHCL3		1.030	UGL
83.3	01-jun-1990	UM20	CHCL3		0.985	UGL

Site: WELL CCB-01-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
77.1	16-apr-1990	99	TDS		516000.000	UGL
77.1	01-jun-1990	99	TDS		564000.000	UGL
77.1	01-jun-1990	SD20	PB		2.490	UGL
77.1	16-apr-1990	SD21	SE		3.410	UGL
77.1	01-jun-1990	SD21	SE		3.330	UGL
77.1	16-apr-1990	SD22	AS		9.380	UGL
77.1	01-jun-1990	SD22	AS		8.640	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL CCB-01-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
77.1	16-apr-1990	SS10	BA		38.300	UGL
77.1	01-jun-1990	SS10	BA		53.900	UGL
77.1	16-apr-1990	SS10	CA		63000.000	UGL
77.1	01-jun-1990	SS10	CA		72000.000	UGL
77.1	16-apr-1990	SS10	CU		8.710	UGL
77.1	01-jun-1990	SS10	CU		25.100	UGL
77.1	16-apr-1990	SS10	NA		41400.000	UGL
77.1	01-jun-1990	SS10	NA		37300.000	UGL
77.1	16-apr-1990	TT10	CL		33000.000	UGL
77.1	01-jun-1990	TT10	CL		32200.000	UGL
77.1	16-apr-1990	TT10	SO4		116000.000	UGL
77.1	01-jun-1990	TT10	SO4		111000.000	UGL

Site: WELL CCB-02-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
82.2	16-apr-1990	99	TDS		740000.000	UGL
85.2	02-jun-1990	99	TDS		808000.000	UGL
82.2	16-apr-1990	SB01	HG		0.488	UGL
85.2	02-jun-1990	SD20	PB		2.930	UGL
82.2	16-apr-1990	SD21	SE		9.690	UGL
85.2	02-jun-1990	SD21	SE		10.600	UGL
82.2	16-apr-1990	SD22	AS		7.250	UGL
85.2	02-jun-1990	SD22	AS		7.140	UGL
82.3	16-apr-1990	SS10	BA		24.700	UGL
85.2	02-jun-1990	SS10	BA		31.200	UGL
82.3	16-apr-1990	SS10	CA		88000.000	UGL
85.2	02-jun-1990	SS10	CA		110000.000	UGL
85.2	02-jun-1990	SS10	CU		8.270	UGL
82.3	16-apr-1990	SS10	NA		48000.000	UGL
85.2	02-jun-1990	SS10	NA		51600.000	UGL
82.3	16-apr-1990	SS10	ZN		48.700	UGL
82.2	16-apr-1990	TT10	CL		100000.000	UGL
85.2	02-jun-1990	TT10	CL		97000.000	UGL
82.2	16-apr-1990	TT10	SO4		260000.000	UGL
85.2	02-jun-1990	TT10	SO4		238000.000	UGL
82.3	16-apr-1990	UM18	UNK600		7.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL CCB-02-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
82.3	16-apr-1990	UM20	TRCLE		6.760	UGL
85.2	02-jun-1990	UM20	TRCLE		4.670	UGL

Site: WELL DMO-03-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
94.8	19-apr-1990	99	TDS		902000.000	UGL
94.8	31-may-1990	99	TDS		1070000.000	UGL
94.8	31-may-1990	99	TDS		1090000.000	UGL
94.8	31-may-1990	SD20	PB		1.950	UGL
94.8	31-may-1990	SD20	PB		4.340	UGL
94.8	19-apr-1990	SD21	SE		11.300	UGL
94.8	31-may-1990	SD21	SE		13.200	UGL
94.8	31-may-1990	SD21	SE		12.600	UGL
94.8	19-apr-1990	SD22	AS		2.880	UGL
94.8	31-may-1990	SD22	AS		2.770	UGL
94.8	19-apr-1990	SS10	BA		35.000	UGL
94.8	31-may-1990	SS10	BA		36.400	UGL
94.8	31-may-1990	SS10	BA		34.400	UGL
94.8	19-apr-1990	SS10	CA		120000.000	UGL
94.8	31-may-1990	SS10	CA		120000.000	UGL
94.8	31-may-1990	SS10	CA		120000.000	UGL
94.8	19-apr-1990	SS10	NA		77000.000	UGL
94.8	31-may-1990	SS10	NA		69000.000	UGL
94.8	31-may-1990	SS10	NA		78000.000	UGL
94.8	19-apr-1990	SS10	ZN		25.300	UGL
94.8	19-apr-1990	TT10	CL		66000.000	UGL
94.8	31-may-1990	TT10	CL		52000.000	UGL
94.8	31-may-1990	TT10	CL		53000.000	UGL
94.8	19-apr-1990	TT10	SO4		450000.000	UGL
94.8	31-may-1990	TT10	SO4		380000.000	UGL
94.8	31-may-1990	TT10	SO4		380000.000	UGL
94.8	19-apr-1990	UM18	UNK557		2.000	UGL
94.8	31-may-1990	UM18	UNK558		5.000	UGL
94.8	19-apr-1990	UM18	UNK559		1.000	UGL
94.8	19-apr-1990	UM18	UNK598		10.000	UGL
94.8	31-may-1990	UM20	CH2CL2		6.600	UGL
94.8	31-may-1990	UM20	CH2CL2		7.450	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL DMO-03-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
94.8	19-apr-1990	UM20	TRCLE		10.500	UGL
94.8	31-may-1990	UM20	TRCLE		2.570	UGL
94.8	31-may-1990	UM20	TRCLE		2.570	UGL

Site: WELL DMO-04-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
94.9	19-apr-1990	99	TDS		710000.000	UGL
94.9	31-may-1990	99	TDS		776000.000	UGL
94.9	31-may-1990	SD20	PB		2.280	UGL
94.9	19-apr-1990	SD21	SE		5.110	UGL
94.9	31-may-1990	SD21	SE		6.220	UGL
94.9	19-apr-1990	SD22	AS		7.040	UGL
94.9	31-may-1990	SD22	AS		4.260	UGL
95.0	19-apr-1990	SS10	BA		17.100	UGL
95.0	31-may-1990	SS10	BA		18.700	UGL
95.0	19-apr-1990	SS10	CA		91000.000	UGL
95.0	31-may-1990	SS10	CA		85000.000	UGL
95.0	19-apr-1990	SS10	NA		64000.000	UGL
95.0	31-may-1990	SS10	NA		67000.000	UGL
95.0	19-apr-1990	SS10	ZN		34.700	UGL
94.9	19-apr-1990	TT10	CL		60000.000	UGL
94.9	31-may-1990	TT10	CL		50000.000	UGL
94.9	19-apr-1990	TT10	SO4		224000.000	UGL
94.9	31-may-1990	TT10	SO4		223000.000	UGL
94.9	19-apr-1990	UM18	UNK598		2.000	UGL
94.9	19-apr-1990	UM20	TRCLE		4.190	UGL
94.9	31-may-1990	UM20	TRCLE		2.190	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL DMO-05-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
94.1	19-apr-1990	99	TDS		826000.000	UGL
94.1	19-apr-1990	99	TDS		840000.000	UGL
94.1	31-may-1990	99	TDS		916000.000	UGL
94.1	19-apr-1990	SD21	SE		11.600	UGL
94.1	19-apr-1990	SD21	SE		11.800	UGL
94.1	31-may-1990	SD21	SE		11.400	UGL
94.1	19-apr-1990	SD22	AS		4.800	UGL
94.1	19-apr-1990	SD22	AS		4.580	UGL
94.1	31-may-1990	SD22	AS		4.480	UGL
94.1	19-apr-1990	SS10	BA		28.900	UGL
94.1	19-apr-1990	SS10	BA		21.400	UGL
94.1	31-may-1990	SS10	BA		23.100	UGL
94.1	19-apr-1990	SS10	CA		97000.000	UGL
94.1	19-apr-1990	SS10	CA		95000.000	UGL
94.1	31-may-1990	SS10	CA		97000.000	UGL
94.1	19-apr-1990	SS10	CU		11.500	UGL
94.1	19-apr-1990	SS10	NA		71000.000	UGL
94.1	19-apr-1990	SS10	NA		64000.000	UGL
94.1	31-may-1990	SS10	NA		75000.000	UGL
94.1	19-apr-1990	SS10	ZN		72.100	UGL
94.1	19-apr-1990	TT10	CL		60000.000	UGL
94.1	19-apr-1990	TT10	CL		60000.000	UGL
94.1	31-may-1990	TT10	CL		60000.000	UGL
94.1	19-apr-1990	TT10	SO4		330000.000	UGL
94.1	19-apr-1990	TT10	SO4		330000.000	UGL
94.1	31-may-1990	TT10	SO4		280000.000	UGL
94.1	19-apr-1990	UM18	B2EHP		4.640	UGL
94.1	19-apr-1990	UM20	TRCLE		20.000	UGL
94.1	19-apr-1990	UM20	TRCLE		25.700	UGL
94.1	31-may-1990	UM20	TRCLE		18.100	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL DSB-04-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
22.9	08-jun-1990	SD21	SE		7.700	UGL
22.9	24-apr-1990	SD22	AS		190.000	UGL
22.9	08-jun-1990	SD22	AS		170.000	UGL
22.9	08-jun-1990	SD23	AG		0.425	UGL
22.9	24-apr-1990	SS10	BA		24.400	UGL
22.9	08-jun-1990	SS10	BA		18.800	UGL
22.9	24-apr-1990	SS10	CA		220000.000	UGL
22.9	08-jun-1990	SS10	CA		220000.000	UGL
22.9	24-apr-1990	SS10	CD		4.070	UGL
22.9	24-apr-1990	SS10	CU		20.100	UGL
22.9	24-apr-1990	SS10	NA		2300000.000	UGL
22.9	08-jun-1990	SS10	NA		2300000.000	UGL
22.9	24-apr-1990	SS10	ZN		28.700	UGL

Site: WELL PSW-02

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
120.0	07-may-1990	99	TDS		850000.000	UGL
120.0	07-may-1990	99	TDS		680000.000	UGL
120.0	07-jun-1990	99	TDS		732000.000	UGL
120.0	07-jun-1990	99	TDS		754000.000	UGL
120.0	07-may-1990	SD20	PB		3.580	UGL
120.0	07-may-1990	SD20	PB		2.820	UGL
120.0	07-jun-1990	SD20	PB		3.470	UGL
120.0	07-jun-1990	SD20	PB		3.250	UGL
120.0	07-jun-1990	SD21	SE		4.370	UGL
120.0	07-may-1990	SD22	AS		5.970	UGL
120.0	07-may-1990	SD22	AS		5.970	UGL
120.0	07-jun-1990	SD22	AS		3.940	UGL
120.0	07-jun-1990	SD22	AS		3.410	UGL
120.0	07-may-1990	SS10	BA		28.400	UGL
120.0	07-may-1990	SS10	BA		22.400	UGL
120.0	07-jun-1990	SS10	BA		39.100	UGL
120.0	07-jun-1990	SS10	BA		25.500	UGL
120.0	07-may-1990	SS10	CA		100000.000	UGL
120.0	07-may-1990	SS10	CA		100000.000	UGL
120.0	07-jun-1990	SS10	CA		110000.000	UGL
120.0	07-jun-1990	SS10	CA		110000.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL PSW-02 (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
120.0	07-jun-1990	SS10	CU		8.260	UGL
120.0	07-may-1990	SS10	NA		87000.000	UGL
120.0	07-may-1990	SS10	NA		12000.000	UGL
120.0	07-jun-1990	SS10	NA		72000.000	UGL
120.0	07-jun-1990	SS10	NA		71000.000	UGL
120.0	07-may-1990	SS10	ZN		61.600	UGL
120.0	07-may-1990	SS10	ZN		61.600	UGL
120.0	07-jun-1990	SS10	ZN		51.500	UGL
120.0	07-jun-1990	TF18	CYN		11.300	UGL
120.0	07-may-1990	TT10	CL		60000.000	UGL
120.0	07-may-1990	TT10	CL		60000.000	UGL
120.0	07-jun-1990	TT10	CL		66000.000	UGL
120.0	07-jun-1990	TT10	CL		66000.000	UGL
120.0	07-may-1990	TT10	SO4		380000.000	UGL
120.0	07-may-1990	TT10	SO4		370000.000	UGL
120.0	07-jun-1990	TT10	SO4		293000.000	UGL
120.0	07-jun-1990	TT10	SO4		300000.000	UGL
120.0	07-may-1990	UM18	12EPCH		2.000	UGL
120.0	07-may-1990	UM18	12EPCH		2.000	UGL
120.0	07-may-1990	UM18	2CHE1L		2.000	UGL
120.0	07-may-1990	UM18	2CHE1L		2.000	UGL
120.0	07-may-1990	UM18	2CHE1O		2.000	UGL
120.0	07-may-1990	UM18	2CHE1O		1.000	UGL
120.0	07-may-1990	UM18	UNK537		7.000	UGL
120.0	07-may-1990	UM18	UNK537		8.000	UGL
120.0	07-may-1990	UM18	UNK555		2.000	UGL
120.0	07-may-1990	UM18	UNK555		4.000	UGL
120.0	07-may-1990	UM18	UNK557		3.000	UGL
120.0	07-may-1990	UM18	UNK557		4.000	UGL
120.0	07-jun-1990	UM18	UNK558		6.000	UGL
120.0	07-may-1990	UM18	UNK563		10.000	UGL
120.0	07-may-1990	UM18	UNK563		10.000	UGL
120.0	07-jun-1990	UM18	UNK564		10.000	UGL
120.0	07-jun-1990	UM18	UNK564		10.000	UGL
120.0	07-may-1990	UM18	UNK599		1.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL PSW-08

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
120.0	07-may-1990	99	TDS		740000.000	UGL
120.0	07-jun-1990	99	TDS		666000.000	UGL
120.0	07-may-1990	SD20	PB		4.770	UGL
120.0	07-jun-1990	SD20	PB		3.900	UGL
120.0	07-may-1990	SD22	AS		7.460	UGL
120.0	07-jun-1990	SD22	AS		4.800	UGL
120.0	07-may-1990	SS10	BA		35.200	UGL
120.0	07-jun-1990	SS10	BA		37.700	UGL
120.0	07-may-1990	SS10	CA		84000.000	UGL
120.0	07-jun-1990	SS10	CA		97000.000	UGL
120.0	07-may-1990	SS10	NA		71000.000	UGL
120.0	07-jun-1990	SS10	NA		79000.000	UGL
120.0	07-may-1990	SS10	ZN		43.400	UGL
120.0	07-jun-1990	SS10	ZN		50.300	UGL
120.0	07-may-1990	TT10	CL		44000.000	UGL
120.0	07-jun-1990	TT10	CL		44000.000	UGL
120.0	07-may-1990	TT10	SO4		310000.000	UGL
120.0	07-jun-1990	TT10	SO4		289000.000	UGL
120.0	07-may-1990	UM18	12EPCH		2.000	UGL
120.0	07-may-1990	UM18	2CHE1L		2.000	UGL
120.0	07-may-1990	UM18	2CHE10		1.000	UGL
120.0	07-may-1990	UM18	UNK537		9.000	UGL
120.0	07-jun-1990	UM18	UNK538		5.000	UGL
120.0	07-jun-1990	UM18	UNK539		4.000	UGL
120.0	07-may-1990	UM18	UNK555		1.000	UGL
120.0	07-may-1990	UM18	UNK563		9.000	UGL
120.0	07-jun-1990	UM18	UNK564		8.000	UGL

Site: WELL PSW-09

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
120.0	07-may-1990	99	TDS		340000.000	UGL
120.0	07-jun-1990	99	TDS		310000.000	UGL
120.0	07-may-1990	SD20	PB		1.950	UGL
120.0	07-jun-1990	SD20	PB		1.950	UGL
120.0	07-may-1990	SD22	AS		3.200	UGL
120.0	07-jun-1990	SD22	AS		4.370	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL PSW-09 (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
120.0	07-may-1990	SS10	BA		55.300	UGL
120.0	07-jun-1990	SS10	BA		60.600	UGL
120.0	07-may-1990	SS10	CA		28000.000	UGL
120.0	07-jun-1990	SS10	CA		31000.000	UGL
120.0	07-may-1990	SS10	NA		50100.000	UGL
120.0	07-jun-1990	SS10	NA		50800.000	UGL
120.0	07-jun-1990	TF18	CYN		11.200	UGL
120.0	07-may-1990	TT10	CL		17100.000	UGL
120.0	07-jun-1990	TT10	CL		16900.000	UGL
120.0	07-may-1990	TT10	SO4		57100.000	UGL
120.0	07-jun-1990	TT10	SO4		50000.000	UGL
120.0	07-may-1990	UM18	UNK537		6.000	UGL

Site: WELL TNT-01-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.4	20-apr-1990	99	TDS		864000.000	UGL
55.4	20-apr-1990	99	TDS		856000.000	UGL
55.4	08-jun-1990	99	TDS		830000.000	UGL
55.4	08-jun-1990	99	TDS		840000.000	UGL
55.4	20-apr-1990	SD20	PB		2.060	UGL
55.4	08-jun-1990	SD20	PB		7.480	UGL
55.4	08-jun-1990	SD20	PB		10.200	UGL
55.4	20-apr-1990	SD22	AS		17.000	UGL
55.4	20-apr-1990	SD22	AS		18.200	UGL
55.4	08-jun-1990	SD22	AS		15.000	UGL
55.4	08-jun-1990	SD22	AS		12.900	UGL
55.4	20-apr-1990	SS10	BA		19.200	UGL
55.4	20-apr-1990	SS10	BA		21.500	UGL
55.4	08-jun-1990	SS10	BA		26.000	UGL
55.4	08-jun-1990	SS10	BA		23.000	UGL
55.4	20-apr-1990	SS10	CA		16600.000	UGL
55.4	20-apr-1990	SS10	CA		17100.000	UGL
55.4	08-jun-1990	SS10	CA		14800.000	UGL
55.4	08-jun-1990	SS10	CA		15300.000	UGL
55.4	20-apr-1990	SS10	NA		190000.000	UGL
55.4	20-apr-1990	SS10	NA		230000.000	UGL
55.4	08-jun-1990	SS10	NA		190000.000	UGL
55.4	08-jun-1990	SS10	NA		210000.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-01-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.4	20-apr-1990	TT10	CL		47000.000	UGL
55.4	20-apr-1990	TT10	CL		53000.000	UGL
55.4	08-jun-1990	TT10	CL		40000.000	UGL
55.4	08-jun-1990	TT10	CL		41000.000	UGL
55.4	20-apr-1990	TT10	SO4		190000.000	UGL
55.4	20-apr-1990	TT10	SO4		200000.000	UGL
55.4	08-jun-1990	TT10	SO4		188000.000	UGL
55.4	08-jun-1990	TT10	SO4		185000.000	UGL
55.4	20-apr-1990	UM18	24DNT		78.600	UGL
55.4	20-apr-1990	UM18	24DNT		88.100	UGL
55.4	08-jun-1990	UM18	24DNT		52.400	UGL
55.4	08-jun-1990	UM18	24DNT		49.300	UGL
55.4	20-apr-1990	UM18	UNK587		4.000	UGL
55.4	20-apr-1990	UM18	UNK587		5.000	UGL
55.4	20-apr-1990	UM18	UNK594		400.000	UGL
55.4	20-apr-1990	UM18	UNK595		400.000	UGL
55.4	08-jun-1990	UM18	UNK595		200.000	UGL
55.4	20-apr-1990	UM20	TRCLE		26.700	UGL
55.4	20-apr-1990	UM20	TRCLE		24.800	UGL
55.4	08-jun-1990	UM20	TRCLE		29.500	UGL
55.4	08-jun-1990	UM20	TRCLE		30.500	UGL
55.4	20-apr-1990	UW14	135TNB		950.000	UGL
55.4	20-apr-1990	UW14	135TNB		1100.000	UGL
55.4	08-jun-1990	UW14	135TNB		640.000	UGL
55.4	08-jun-1990	UW14	135TNB		1100.000	UGL
55.4	20-apr-1990	UW14	246TNT		1.050	UGL
55.4	08-jun-1990	UW14	246TNT		1.220	UGL
55.4	20-apr-1990	UW14	24DNT		66.000	UGL
55.4	20-apr-1990	UW14	24DNT		90.000	UGL
55.4	08-jun-1990	UW14	24DNT		46.700	UGL
55.4	08-jun-1990	UW14	24DNT		86.000	UGL
55.4	20-apr-1990	UW14	HMX		3.700	UGL
55.4	20-apr-1990	UW14	HMX		1.950	UGL
55.4	20-apr-1990	UW14	RDX		90.000	UGL
55.4	20-apr-1990	UW14	RDX		99.000	UGL
55.4	08-jun-1990	UW14	RDX		54.000	UGL
55.4	08-jun-1990	UW14	RDX		87.000	UGL
55.4	20-apr-1990	UW14	TETRYL		9.920	UGL
55.4	20-apr-1990	UW14	TETRYL		9.680	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-01-MWB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.0	20-apr-1990	99	TDS		878000.000	UGL
56.0	05-jun-1990	99	TDS		946000.000	UGL
56.0	05-jun-1990	SD20	PB		1.630	UGL
56.0	20-apr-1990	SD22	AS		7.250	UGL
56.0	05-jun-1990	SD22	AS		5.440	UGL
56.0	20-apr-1990	SS10	BA		22.000	UGL
56.0	05-jun-1990	SS10	BA		21.900	UGL
56.0	20-apr-1990	SS10	CA		69000.000	UGL
56.0	05-jun-1990	SS10	CA		81000.000	UGL
56.0	20-apr-1990	SS10	NA		180000.000	UGL
56.0	05-jun-1990	SS10	NA		190000.000	UGL
56.0	20-apr-1990	SS10	ZN		26.900	UGL
56.0	05-jun-1990	SS10	ZN		135.000	UGL
56.0	20-apr-1990	TT10	CL		120000.000	UGL
56.0	05-jun-1990	TT10	CL		130000.000	UGL
56.0	20-apr-1990	TT10	SO4		260000.000	UGL
56.0	05-jun-1990	TT10	SO4		270000.000	UGL
56.0	05-jun-1990	UM18	2BEETO		800.000	UGL
56.0	20-apr-1990	UM18	B2EHP		4.820	UGL
56.0	20-apr-1990	UM18	UNK537		3.000	UGL
56.0	20-apr-1990	UM18	UNK557		7.000	UGL
56.0	05-jun-1990	UM18	UNK558		4.000	UGL
56.0	20-apr-1990	UM18	UNK559		6.000	UGL
56.0	20-apr-1990	UM18	UNK563		3.000	UGL
56.0	20-apr-1990	UM18	UNK572		2.000	UGL
56.0	05-jun-1990	UM18	UNK598		10.000	UGL

Site: WELL TNT-01-MWC

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.9	20-apr-1990	99	TDS		806000.000	UGL
55.9	05-jun-1990	99	TDS		766000.000	UGL
55.9	05-jun-1990	SD20	PB		3.360	UGL
55.9	20-apr-1990	SD22	AS		6.930	UGL
55.9	05-jun-1990	SD22	AS		6.180	UGL
55.9	20-apr-1990	SS10	BA		34.900	UGL
55.9	05-jun-1990	SS10	BA		30.600	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-01-MWC (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.9	20-apr-1990	SS10	CA		70000.000	UGL
55.9	05-jun-1990	SS10	CA		84000.000	UGL
55.9	20-apr-1990	SS10	NA		140000.000	UGL
55.9	05-jun-1990	SS10	NA		140000.000	UGL
55.9	20-apr-1990	SS10	ZN		109.000	UGL
55.9	05-jun-1990	SS10	ZN		210.000	UGL
55.9	20-apr-1990	TT10	CL		90000.000	UGL
55.9	05-jun-1990	TT10	CL		82000.000	UGL
55.9	20-apr-1990	TT10	SO4		250000.000	UGL
55.9	05-jun-1990	TT10	SO4		220000.000	UGL
55.9	05-jun-1990	UM18	2BEETO		4000.000	UGL
55.9	05-jun-1990	UM18	B2EHP		6.450	UGL
55.9	20-apr-1990	UM18	UNK537		3.000	UGL
55.9	05-jun-1990	UM18	UNK537		5.000	.GL
55.9	20-apr-1990	UM18	UNK557		5.000	UGL
55.9	20-apr-1990	UM18	UNK559		4.000	UGL
55.9	05-jun-1990	UM18	UNK559		20.000	UGL
55.9	20-apr-1990	UM18	UNK563		4.000	UGL
55.9	05-jun-1990	UM18	UNK595		30.000	UGL
55.9	05-jun-1990	UM20	CHCL3		1.130	UGL
55.9	05-jun-1990	UM20	TRCLE		2.000	UGL
55.9	20-apr-1990	UW14	135TNB		0.793	UGL
55.9	05-jun-1990	UW14	RDX		4.180	UGL

Site: WELL TNT-02-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
54.3	21-apr-1990	99	TDS		1280000.000	UGL
54.3	04-jun-1990	99	TDS		1280000.000	UGL
54.3	04-jun-1990	SD20	PB		5.420	UGL
54.3	21-apr-1990	SD21	SE		4.050	UGL
54.3	04-jun-1990	SD21	SE		3.910	UGL
54.3	21-apr-1990	SD22	AS		6.500	UGL
54.3	04-jun-1990	SD22	AS		7.360	UGL
54.3	21-apr-1990	SS10	BA		31.600	UGL
54.3	04-jun-1990	SS10	BA		38.800	UGL
54.3	21-apr-1990	SS10	CA		49000.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-02-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
54.3	04-jun-1990	SS10	CA		56000.000	UGL
54.3	04-jun-1990	SS10	CR		6.070	UGL
54.3	21-apr-1990	SS10	NA		270000.000	UGL
54.3	04-jun-1990	SS10	NA		270000.000	UGL
54.3	04-jun-1990	SS10	ZN		23.800	UGL
54.3	21-apr-1990	TT10	CL		160000.000	UGL
54.3	04-jun-1990	TT10	CL		160000.000	UGL
54.3	21-apr-1990	TT10	SO4		260000.000	UGL
54.3	04-jun-1990	TT10	SO4		260000.000	UGL
54.3	21-apr-1990	UM18	2CNE10		1.000	UGL
54.3	04-jun-1990	UM18	2CNE10		4.000	UGL
54.3	21-apr-1990	UM18	UNK517		5.000	UGL
54.3	21-apr-1990	UM18	UNK533		1.000	UGL
54.3	21-apr-1990	UM18	UNK554		1.000	UGL
54.3	21-apr-1990	UM18	UNK563		0.800	UGL
54.3	21-apr-1990	UM18	UNK565		0.800	UGL
54.3	21-apr-1990	UM18	UNK583		0.700	UGL
54.3	21-apr-1990	UM18	UNK585		2.000	UGL
54.3	21-apr-1990	UM18	UNK587		2.000	UGL
54.3	21-apr-1990	UM18	UNK595		80.000	UGL
54.3	04-jun-1990	UM18	UNK595		30.000	UGL
54.3	21-apr-1990	UM18	UNK604		1.000	UGL
54.3	21-apr-1990	UM18	UNK607		1.000	UGL
54.3	21-apr-1990	UM20	TRCLE		3.520	UGL
54.3	04-jun-1990	UM20	TRCLE		2.570	UGL
54.3	21-apr-1990	UW14	135TNB		230.000	UGL
54.3	04-jun-1990	UW14	135TNB		220.000	UGL
54.3	21-apr-1990	UW14	246TNT		7.860	UGL
54.3	04-jun-1990	UW14	246TNT		8.140	UGL
54.3	21-apr-1990	UW14	24DNT		6.920	UGL
54.3	04-jun-1990	UW14	24DNT		5.930	UGL
54.3	21-apr-1990	UW14	HMX		3.760	UGL
54.3	21-apr-1990	UW14	RDX		250.000	UGL
54.3	04-jun-1990	UW14	RDX		220.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-02-MWB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
54.6	21-apr-1990	99	TDS		976000.000	UGL
54.6	04-jun-1990	99	TDS		900000.000	UGL
54.6	04-jun-1990	SD20	PB		3.250	UGL
54.6	21-apr-1990	SD22	AS		6.930	UGL
54.6	04-jun-1990	SD22	AS		14.000	UGL
54.6	21-apr-1990	SS10	BA		20.600	UGL
54.6	04-jun-1990	SS10	BA		18.700	UGL
54.6	21-apr-1990	SS10	CA		57000.000	UGL
54.6	04-jun-1990	SS10	CA		62000.000	UGL
54.6	21-apr-1990	SS10	NA		180000.000	UGL
54.6	04-jun-1990	SS10	NA		210000.000	UGL
54.6	21-apr-1990	SS10	ZN		46.600	UGL
54.6	04-jun-1990	SS10	ZN		90.100	UGL
54.6	21-apr-1990	TT10	CL		140000.000	UGL
54.6	04-jun-1990	TT10	CL		140000.000	UGL
54.6	21-apr-1990	TT10	SO4		250000.000	UGL
54.6	04-jun-1990	TT10	SO4		260000.000	UGL
54.6	04-jun-1990	UM18	2BEETO		3000.000	UGL
54.6	04-jun-1990	UM18	2BUXEL		30.000	UGL
54.6	04-jun-1990	UM18	B2EHP		4.550	UGL
54.6	04-jun-1990	UM18	BTZ		6.000	UGL
54.6	21-apr-1990	UM18	UNK546		1.000	UGL
54.6	04-jun-1990	UM18	UNK559		50.000	UGL
54.6	04-jun-1990	UM18	UNK595		10.000	UGL
54.6	04-jun-1990	UM18	UNK599		500.000	UGL
54.6	04-jun-1990	UM18	UNK601		4.000	UGL
54.6	04-jun-1990	UM18	UNK613		20.000	UGL
54.6	04-jun-1990	UM18	UNK634		6.000	UGL
54.6	04-jun-1990	UW14	135TNB		1.380	UGL
54.6	04-jun-1990	UW14	TETRYL		0.754	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-02-MWC

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
53.9	21-apr-1990	99	TDS		738000.000	UGL
54.0	04-jun-1990	99	TDS		726000.000	UGL
53.9	04-jun-1990	SD20	PB		2.930	UGL
53.9	21-apr-1990	SD22	AS		5.650	UGL
53.9	04-jun-1990	SD22	AS		5.120	UGL
53.9	21-apr-1990	SS10	BA		7.130	UGL
54.0	04-jun-1990	SS10	BA		8.800	UGL
53.9	21-apr-1990	SS10	CA		14600.000	UGL
54.0	04-jun-1990	SS10	CA		8420.000	UGL
53.9	21-apr-1990	SS10	CR		11.800	UGL
54.0	04-jun-1990	SS10	CR		9.060	UGL
53.9	21-apr-1990	SS10	NA		160000.000	UGL
54.0	04-jun-1990	SS10	NA		170000.000	UGL
53.9	21-apr-1990	TT10	CL		77000.000	UGL
54.0	04-jun-1990	TT10	CL		77000.000	UGL
53.9	21-apr-1990	TT10	SO4		240000.000	UGL
54.0	04-jun-1990	TT10	SO4		233000.000	UGL
54.0	04-jun-1990	UM18	2BEETO		4000.000	UGL
54.0	04-jun-1990	UM18	B2EHP		14.500	UGL
54.0	04-jun-1990	UM18	BTZ		9.000	UGL
54.0	21-apr-1990	UM18	UNK557		1.000	UGL
54.0	04-jun-1990	UM18	UNK559		20.000	UGL
54.0	04-jun-1990	UM18	UNK575		10.000	UGL
54.0	04-jun-1990	UM18	UNK595		30.000	UGL
54.0	04-jun-1990	UM18	UNK598		9.000	UGL
54.0	04-jun-1990	UM18	UNK614		70.000	UGL
54.0	21-apr-1990	UM18	UNK619		10.000	UGL
54.0	04-jun-1990	UM18	UNK634		20.000	UGL
54.0	21-apr-1990	UM20	CH2CL2		8.490	UGL
53.9	04-jun-1990	UW14	TETRYL		0.813	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-03-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
52.7	01-may-1990	99	TDS		956000.000	UGL
52.7	08-jun-1990	99	TDS		808000.000	UGL
52.7	01-may-1990	SD22	AS		10.300	UGL
52.7	08-jun-1990	SD22	AS		7.890	UGL
52.7	01-may-1990	SS10	BA		46.400	UGL
52.7	08-jun-1990	SS10	BA		34.000	UGL
52.7	01-may-1990	SS10	CA		40000.000	UGL
52.7	08-jun-1990	SS10	CA		27000.000	UGL
52.7	01-may-1990	SS10	NA		220000.000	UGL
52.7	08-jun-1990	SS10	NA		220000.000	UGL
52.7	01-may-1990	TT10	CL		44000.000	UGL
52.7	08-jun-1990	TT10	CL		46000.000	UGL
52.7	01-may-1990	TT10	SO4		107000.000	UGL
52.7	08-jun-1990	TT10	SO4		102000.000	UGL
52.7	01-may-1990	UM18	24DNP		17.500	UGL
52.7	01-may-1990	UM18	24DNT		13.600	UGL
52.7	01-may-1990	UM18	UNK517		5.000	UGL
52.7	01-may-1990	UM18	UNK555		2.000	UGL
52.7	01-may-1990	UM18	UNK557		1.000	UGL
52.7	01-may-1990	UM18	UNK569		3.000	UGL
52.7	01-may-1990	UM18	UNK574		1.000	UGL
52.7	01-may-1990	UM18	UNK607		10.000	UGL
52.7	01-may-1990	UW14	135TNB		9.960	UGL
52.7	08-jun-1990	UW14	135TNB		13.000	UGL
52.7	01-may-1990	UW14	246TNT		2.940	UGL
52.7	01-may-1990	UW14	24DNT		12.600	UGL
52.7	08-jun-1990	UW14	24DNT		6.190	UGL
52.7	01-may-1990	UW14	HMX		7.690	UGL
52.7	01-may-1990	UW14	RDX		220.000	UGL
52.7	08-jun-1990	UW14	RDX		34.200	UGL

Site: WELL TNT-04-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
53.7	01-may-1990	99	TDS		996000.000	UGL
53.7	08-jun-1990	99	TDS		940000.000	UGL
53.7	01-may-1990	SD21	SE		4.370	UGL
53.7	08-jun-1990	SD21	SE		3.620	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-04-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
53.7	01-may-1990	SD22	AS		8.100	UGL
53.7	08-jun-1990	SD22	AS		5.650	UGL
53.7	01-may-1990	SS10	BA		40.400	UGL
53.7	08-jun-1990	SS10	BA		35.500	UGL
53.7	01-may-1990	SS10	CA		43000.000	UGL
53.7	08-jun-1990	SS10	CA		46000.000	UGL
53.7	01-may-1990	SS10	NA		200000.000	UGL
53.7	08-jun-1990	SS10	NA		220000.000	UGL
53.7	01-may-1990	TT10	CL		200000.000	UGL
53.7	08-jun-1990	TT10	CL		180000.000	UGL
53.7	01-may-1990	TT10	SO4		260000.000	UGL
53.7	08-jun-1990	TT10	SO4		243000.000	UGL
53.7	01-may-1990	UM18	24DNT		6.810	UGL
53.7	01-may-1990	UM18	UNK533		2.000	UGL
53.7	01-may-1990	UW14	135TNB		2.990	UGL
53.7	08-jun-1990	UW14	135TNB		3.380	UGL
53.7	01-may-1990	UW14	246TNT		1.240	UGL
53.7	08-jun-1990	UW14	246TNT		1.030	UGL
53.7	01-may-1990	UW14	24DNT		8.140	UGL
53.7	08-jun-1990	UW14	24DNT		10.300	UGL

Site: WELL TNT-05-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
58.5	02-may-1990	99	TDS		786000.000	UGL
58.5	07-jun-1990	99	TDS		716000.000	UGL
58.5	02-may-1990	SD21	SE		4.150	UGL
58.5	07-jun-1990	SD21	SE		3.510	UGL
58.5	02-may-1990	SD22	AS		17.100	UGL
58.5	07-jun-1990	SD22	AS		17.000	UGL
58.5	02-may-1990	SS10	BA		33.200	UGL
58.5	07-jun-1990	SS10	BA		40.200	UGL
58.5	02-may-1990	SS10	CA		39000.000	UGL
58.5	07-jun-1990	SS10	CA		47000.000	UGL
58.5	02-may-1990	SS10	NA		150000.000	UGL
58.5	07-jun-1990	SS10	NA		170000.000	UGL
58.5	07-jun-1990	SS10	ZN		25.100	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-05-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
58.5	02-may-1990	TT10	CL		71000.000	UGL
58.5	07-jun-1990	TT10	CL		66000.000	UGL
58.5	02-may-1990	TT10	SO4		115000.000	UGL
58.5	07-jun-1990	TT10	SO4		138000.000	UGL
58.5	02-may-1990	UM18	2CHE1O		1.000	UGL
58.5	02-may-1990	UM18	B2EHP		7.820	UGL
58.5	02-may-1990	UM18	UNK556		1.000	UGL
58.5	02-may-1990	UW14	135TNB		5.280	UGL
58.5	07-jun-1990	UW14	135TNB		6.470	UGL

Site: WELL TNT-06-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
54.6	02-may-1990	99	TDS		1570000.000	UGL
54.6	06-jun-1990	99	TDS		1530000.000	UGL
54.6	06-jun-1990	SB01	HG		0.251	UGL
54.6	06-jun-1990	SD20	PB		7.050	UGL
54.6	02-may-1990	SD21	SE		8.840	UGL
54.6	06-jun-1990	SD21	SE		6.820	UGL
54.6	02-may-1990	SD22	AS		9.700	UGL
54.6	06-jun-1990	SD22	AS		5.650	UGL
54.6	02-may-1990	SS10	BA		46.400	UGL
54.6	06-jun-1990	SS10	BA		52.500	UGL
54.6	02-may-1990	SS10	CA		66000.000	UGL
54.6	06-jun-1990	SS10	CA		70000.000	UGL
54.6	02-may-1990	SS10	NA		390000.000	UGL
54.6	06-jun-1990	SS10	NA		370000.000	UGL
54.6	06-jun-1990	SS10	ZN		23.300	UGL
54.6	02-may-1990	TT10	CL		240000.000	UGL
54.6	06-jun-1990	TT10	CL		240000.000	UGL
54.6	02-may-1990	TT10	SO4		440000.000	UGL
54.6	06-jun-1990	TT10	SO4		400000.000	UGL
54.6	02-may-1990	UM18	UNK517		1.000	UGL
54.6	02-may-1990	UM18	UNK556		1.000	UGL
54.6	02-may-1990	UM18	UNK634		5.000	UGL

Site: WELL TNT-06-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
54.6	02-may-1990	UW14	135TNB		1.650	UGL
54.6	06-jun-1990	UW14	135TNB		2.340	UGL
54.6	06-jun-1990	UW14	24DNT		0.850	UGL

Site: WELL TNT-07-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.1	18-apr-1990	99	TDS		978000.000	UGL
56.1	06-jun-1990	99	TDS		802000.000	UGL
56.1	06-jun-1990	SD20	PB		6.620	UGL
56.1	18-apr-1990	SD22	AS		15.400	UGL
56.1	06-jun-1990	SD22	AS		9.810	UGL
56.1	18-apr-1990	SS10	BA		14.300	UGL
56.1	06-jun-1990	SS10	BA		17.600	UGL
56.1	18-apr-1990	SS10	CA		15600.000	UGL
56.1	06-jun-1990	SS10	CA		18500.000	UGL
56.1	18-apr-1990	SS10	CR		6.890	UGL
56.1	06-jun-1990	SS10	CR		9.500	UGL
56.1	18-apr-1990	SS10	NA		220000.000	UGL
56.1	06-jun-1990	SS10	NA		240000.000	UGL
56.1	18-apr-1990	SS10	ZN		68.000	UGL
56.1	18-apr-1990	TT10	CL		99000.000	UGL
56.1	06-jun-1990	TT10	CL		93000.000	UGL
56.1	18-apr-1990	TT10	SO4		181000.000	UGL
56.1	06-jun-1990	TT10	SO4		176000.000	UGL
56.1	06-jun-1990	UM20	CHCL3		0.523	UGL
56.1	18-apr-1990	UM20	TRCLE		2.290	UGL
56.1	06-jun-1990	UM20	TRCLE		2.480	UGL
56.1	18-apr-1990	UW14	135TNB		5.590	UGL
56.1	06-jun-1990	UW14	135TNB		4.980	UGL
56.1	18-apr-1990	UW14	24DNT		2.040	UGL
56.1	06-jun-1990	UW14	24DNT		2.560	UGL
56.1	18-apr-1990	UW14	TETRYL		2.790	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-07-MWB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.0	18-apr-1990	99	TDS		1160000.000	UGL
56.0	06-jun-1990	99	TDS		814000.000	UGL
56.0	06-jun-1990	SD20	PB		9.000	UGL
56.0	18-apr-1990	SD22	AS		8.960	UGL
56.0	06-jun-1990	SD22	AS		7.890	UGL
56.0	18-apr-1990	SS10	BA		22.400	UGL
56.0	06-jun-1990	SS10	BA		15.500	UGL
56.0	18-apr-1990	SS10	CA		44000.000	UGL
56.0	06-jun-1990	SS10	CA		31000.000	UGL
56.0	06-jun-1990	SS10	CR		7.810	UGL
56.0	18-apr-1990	SS10	CU		9.560	UGL
56.0	18-apr-1990	SS10	NA		210000.000	UGL
56.0	06-jun-1990	SS10	NA		220000.000	UGL
56.0	18-apr-1990	SS10	ZN		77.100	UGL
56.0	18-apr-1990	TT10	CL		150000.000	UGL
56.0	06-jun-1990	TT10	CL		110000.000	UGL
56.0	18-apr-1990	TT10	SO4		260000.000	UGL
56.0	06-jun-1990	TT10	SO4		203000.000	UGL
56.0	06-jun-1990	UM18	2BEETO		2000.000	UGL
56.0	06-jun-1990	UM18	BTZ		4.000	UGL
56.0	06-jun-1990	UM18	UNK595		8.000	UGL

Site: WELL TNT-07-MWC

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.0	18-apr-1990	99	TDS		812000.000	UGL
56.0	06-jun-1990	99	TDS		760000.000	UGL
56.0	06-jun-1990	SD20	PB		8.790	UGL
56.0	18-apr-1990	SD22	AS		8.530	UGL
56.0	06-jun-1990	SD22	AS		5.650	UGL
56.0	18-apr-1990	SS10	BA		27.500	UGL
56.0	06-jun-1990	SS10	BA		28.100	UGL
56.0	18-apr-1990	SS10	CA		57000.000	UGL
56.0	06-jun-1990	SS10	CA		76000.000	UGL
56.0	18-apr-1990	SS10	NA		150000.000	UGL
56.0	06-jun-1990	SS10	NA		150000.000	UGL
56.0	18-apr-1990	SS10	ZN		32.700	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-07-MWC (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.0	06-jun-1990	SS10	ZN		47.300	UGL
56.0	18-apr-1990	TT10	CL		99000.000	UGL
56.0	06-jun-1990	TT10	CL		99000.000	UGL
56.0	18-apr-1990	TT10	SO4		260000.000	UGL
56.0	06-jun-1990	TT10	SO4		211000.000	UGL
56.0	06-jun-1990	UM18	2BEETO		3000.000	UGL
56.0	06-jun-1990	UM18	BTZ		4.000	UGL
56.0	18-apr-1990	UM18	UNK557		3.000	UGL
56.0	18-apr-1990	UM18	UNK559		2.000	UGL
56.0	06-jun-1990	UM18	UNK559		5.000	UGL
56.0	18-apr-1990	UM18	UNK563		2.000	UGL
56.0	06-jun-1990	UM18	UNK595		20.000	UGL
56.0	06-jun-1990	UM18	UNK598		20.000	UGL
56.0	06-jun-1990	UM18	UNK614		10.000	UGL
56.0	06-jun-1990	UM18	UNK634		5.000	UGL
56.0	06-jun-1990	UM18	UNK643		40.000	UGL

Site: WELL TNT-08-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.3	03-may-1990	99	TDS		792000.000	UGL
55.3	07-jun-1990	99	TDS		778000.000	UGL
55.3	03-may-1990	SD20	PB		5.210	UGL
55.3	07-jun-1990	SD20	PB		2.170	UGL
55.3	03-may-1990	SD22	AS		13.300	UGL
55.3	07-jun-1990	SD22	AS		10.100	UGL
55.3	03-may-1990	SS10	BA		27.100	UGL
55.3	07-jun-1990	SS10	BA		46.000	UGL
55.3	03-may-1990	SS10	CA		18000.000	UGL
55.3	07-jun-1990	SS10	CA		18900.000	UGL
55.3	03-may-1990	SS10	NA		200000.000	UGL
55.3	07-jun-1990	SS10	NA		200000.000	UGL
55.3	07-jun-1990	SS10	ZN		26.000	UGL
55.3	03-may-1990	TT10	CL		48000.000	UGL
55.3	07-jun-1990	TT10	CL		52000.000	UGL
55.3	03-may-1990	TT10	SO4		240000.000	UGL
55.3	07-jun-1990	TT10	SO4		239000.000	UGL
55.3	03-may-1990	UM18	UNK533		2.000	UGL

Site: WELL TNT-08-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.3	03-may-1990	UM18	UNK556		2.000	UGL
55.3	03-may-1990	UM20	TRCLE		7.430	UGL
55.3	07-jun-1990	UM20	TRCLE		9.330	UGL
55.3	03-may-1990	UW14	135TNB		0.892	UGL
55.3	07-jun-1990	UW14	135TNB		0.885	UGL
55.3	03-may-1990	UW14	TETRYL		1.560	UGL

Site: WELL TNT-09-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.0	03-may-1990	99	TDS		752000.000	UGL
55.0	06-jun-1990	99	TDS		736000.000	UGL
55.0	03-may-1990	SD20	PB		2.930	UGL
55.0	06-jun-1990	SD20	PB		10.700	UGL
55.0	03-may-1990	SD22	AS		8.960	UGL
55.0	06-jun-1990	SD22	AS		4.900	UGL
55.0	03-may-1990	SS10	BA		52.200	UGL
55.0	06-jun-1990	SS10	BA		56.300	UGL
55.0	03-may-1990	SS10	CA		66000.000	UGL
55.0	06-jun-1990	SS10	CA		75000.000	UGL
55.0	03-may-1990	SS10	NA		120000.000	UGL
55.0	06-jun-1990	SS10	NA		140000.000	UGL
55.0	03-may-1990	TT10	CL		43000.000	UGL
55.0	06-jun-1990	TT10	CL		43000.000	UGL
55.0	03-may-1990	TT10	SO4		280000.000	UGL
55.0	06-jun-1990	TT10	SO4		280000.000	UGL
55.0	03-may-1990	UM18	UNK556		6.000	UGL
55.0	03-may-1990	UM20	TRCLE		0.924	UGL
55.0	06-jun-1990	UM20	TRCLE		1.050	UGL
55.0	03-may-1990	UW14	135TNB		1.470	UGL
55.0	06-jun-1990	UW14	135TNB		3.810	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-10-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.0	30-apr-1990	99	TDS		1050000.000	UGL
56.0	30-apr-1990	99	TDS		994000.000	UGL
56.0	03-jun-1990	99	TDS		1010000.000	UGL
56.0	03-jun-1990	99	TDS		932000.000	UGL
56.0	30-apr-1990	SB01	HG		0.255	UGL
56.0	30-apr-1990	SD20	PB		2.490	UGL
56.0	03-jun-1990	SD20	PB		3.800	UGL
56.0	03-jun-1990	SD20	PB		2.280	UGL
56.0	30-apr-1990	SD22	AS		12.000	UGL
56.0	30-apr-1990	SD22	AS		11.500	UGL
56.0	03-jun-1990	SD22	AS		10.200	UGL
56.0	03-jun-1990	SD22	AS		10.600	UGL
56.0	30-apr-1990	SS10	BA		47.100	UGL
56.0	30-apr-1990	SS10	BA		46.700	UGL
56.0	03-jun-1990	SS10	BA		49.400	UGL
56.0	03-jun-1990	SS10	BA		49.800	UGL
56.0	30-apr-1990	SS10	CA		59000.000	UGL
56.0	30-apr-1990	SS10	CA		61000.000	UGL
56.0	03-jun-1990	SS10	CA		65000.000	UGL
56.0	03-jun-1990	SS10	CA		64000.000	UGL
56.0	30-apr-1990	SS10	CR		227.000	UGL
56.0	30-apr-1990	SS10	CR		225.000	UGL
56.0	03-jun-1990	SS10	CR		213.000	UGL
56.0	03-jun-1990	SS10	CR		223.000	UGL
56.0	30-apr-1990	SS10	NA		260000.000	UGL
56.0	30-apr-1990	SS10	NA		270000.000	UGL
56.0	03-jun-1990	SS10	NA		270000.000	UGL
56.0	03-jun-1990	SS10	NA		220000.000	UGL
56.0	30-apr-1990	TT10	CL		88000.000	UGL
56.0	30-apr-1990	TT10	CL		86000.000	UGL
56.0	03-jun-1990	TT10	CL		77000.000	UGL
56.0	03-jun-1990	TT10	CL		77000.000	UGL
56.0	30-apr-1990	TT10	SO4		190000.000	UGL
56.0	30-apr-1990	TT10	SO4		189000.000	UGL
56.0	03-jun-1990	TT10	SO4		179000.000	UGL
56.0	03-jun-1990	TT10	SO4		177000.000	UGL
56.0	30-apr-1990	UM18	UNK532		2.000	UGL
56.0	30-apr-1990	UM18	UNK532		2.000	UGL
56.0	30-apr-1990	UM18	UNK537		5.000	UGL
56.0	30-apr-1990	UM18	UNK537		4.000	UGL
56.0	03-jun-1990	UM18	UNK538		8.000	UGL
56.0	03-jun-1990	UM18	UNK538		8.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-10-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.0	30-apr-1990	UM18	UNK587		1.000	UGL
56.0	30-apr-1990	UM20	12DCLE		101.000	UGL
56.0	30-apr-1990	UM20	12DCLE		101.000	UGL
56.0	03-jun-1990	UM20	12DCLE		50.300	UGL
56.0	03-jun-1990	UM20	12DCLE		70.400	UGL
56.0	03-jun-1990	UM20	C6H6		5.940	UGL
56.0	30-apr-1990	UM20	CCL4		190.000	UGL
56.0	30-apr-1990	UM20	CCL4		190.000	UGL
56.0	03-jun-1990	UM20	CCL4		95.200	UGL
56.0	03-jun-1990	UM20	CCL4		95.200	UGL
56.0	30-apr-1990	UM20	CHCL3		923.000	UGL
56.0	30-apr-1990	UM20	CHCL3		513.000	UGL
56.0	03-jun-1990	UM20	CHCL3		513.000	UGL
56.0	03-jun-1990	UM20	CHCL3		513.000	UGL
56.0	03-jun-1990	UM20	CLC6H5		6.730	UGL
56.0	30-apr-1990	UM20	MEC6H5		2.450	UGL
56.0	03-jun-1990	UM20	MEC6H5		7.840	UGL
56.0	30-apr-1990	UM20	TRCLE		952.000	UGL
56.0	30-apr-1990	UM20	TRCLE		952.000	UGL
56.0	03-jun-1990	UM20	TRCLE		476.000	UGL
56.0	03-jun-1990	UM20	TRCLE		571.000	UGL

Site: WELL TNT-10-MWB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.8	30-apr-1990	99	TDS		802000.000	UGL
56.8	03-jun-1990	99	TDS		830000.000	UGL
56.8	03-jun-1990	SD20	PB		2.820	UGL
56.8	30-apr-1990	SD22	AS		11.400	UGL
56.8	03-jun-1990	SD22	AS		12.800	UGL
56.8	30-apr-1990	SS10	BA		23.900	UGL
56.8	03-jun-1990	SS10	BA		19.100	UGL
56.8	30-apr-1990	SS10	CA		55000.000	UGL
56.8	03-jun-1990	SS10	CA		61000.000	UGL
56.8	30-apr-1990	SS10	CD		12.900	UGL
56.8	30-apr-1990	SS10	NA		180000.000	UGL
56.8	03-jun-1990	SS10	NA		180000.000	UGL
56.8	30-apr-1990	SS10	ZN		81.700	UGL
56.8	03-jun-1990	SS10	ZN		176.000	UGL
56.8	30-apr-1990	TT10	CL		130000.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-10-MWB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.8	03-jun-1990	TT10	CL		100000.000	UGL
56.8	30-apr-1990	TT10	SO4		233000.000	UGL
56.8	03-jun-1990	TT10	SO4		231000.000	UGL
56.8	03-jun-1990	UM18	2BEETO		2000.000	UGL
56.8	30-apr-1990	UM18	UNK557		3.000	UGL
56.8	30-apr-1990	UM18	UNK559		2.000	UGL
56.8	30-apr-1990	UM18	UNK563		2.000	UGL
56.8	03-jun-1990	UM18	UNK598		70.000	UGL
56.8	30-apr-1990	UM20	CHCL3		0.697	UGL
56.8	30-apr-1990	UM20	TRCLE		0.724	UGL
56.8	03-jun-1990	UM20	TRCLE		0.838	UGL

Site: WELL TNT-10-MWC

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
55.9	30-apr-1990	99	TDS		636000.000	UGL
55.9	03-jun-1990	99	TDS		640000.000	UGL
55.9	03-jun-1990	SD20	PB		2.930	UGL
55.9	30-apr-1990	SD22	AS		12.400	UGL
55.9	03-jun-1990	SD22	AS		9.380	UGL
55.9	30-apr-1990	SS10	BA		33.600	UGL
55.9	03-jun-1990	SS10	BA		32.100	UGL
55.9	30-apr-1990	SS10	CA		55000.000	UGL
55.9	03-jun-1990	SS10	CA		61000.000	UGL
55.9	30-apr-1990	SS10	NA		130000.000	UGL
55.9	03-jun-1990	SS10	NA		130000.000	UGL
55.9	30-apr-1990	TT10	CL		71000.000	UGL
55.9	03-jun-1990	TT10	CL		60000.000	UGL
55.9	30-apr-1990	TT10	SO4		212000.000	UGL
55.9	03-jun-1990	TT10	SO4		202000.000	UGL
55.9	30-apr-1990	UM18	UNK557		3.000	UGL
55.9	30-apr-1990	UM18	UNK559		2.000	UGL
55.9	30-apr-1990	UM18	UNK563		1.000	UGL
55.9	30-apr-1990	UM20	CHCL3		1.230	UGL
55.9	30-apr-1990	UM20	TRCLE		2.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-11-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
59.2	03-may-1990	99	TDS		2180000.000	UGL
59.2	07-jun-1990	99	TDS		2090000.000	UGL
59.2	03-may-1990	SD20	PB		1.520	UGL
59.2	03-may-1990	SD21	SE		9.160	UGL
59.2	07-jun-1990	SD21	SE		7.990	UGL
59.2	03-may-1990	SD22	AS		15.200	UGL
59.2	07-jun-1990	SD22	AS		9.910	UGL
59.2	03-may-1990	SS10	BA		17.300	UGL
59.2	07-jun-1990	SS10	BA		18.100	UGL
59.2	03-may-1990	SS10	CA		130000.000	UGL
59.2	07-jun-1990	SS10	CA		130000.000	UGL
59.2	03-may-1990	SS10	NA		470000.000	UGL
59.2	07-jun-1990	SS10	NA		570000.000	UGL
59.2	03-may-1990	TT10	CL		190000.000	UGL
59.2	07-jun-1990	TT10	CL		180000.000	UGL
59.2	03-may-1990	TT10	SO4		790000.000	UGL
59.2	07-jun-1990	TT10	SO4		700000.000	UGL
59.2	03-may-1990	UM18	UNK556		3.000	UGL
59.2	03-may-1990	UM20	12DCLE		0.824	UGL
59.2	03-may-1990	UM20	CCL4		11.400	UGL
59.2	07-jun-1990	UM20	CCL4		19.000	UGL
59.2	03-may-1990	UM20	CHCL3		21.500	UGL
59.2	07-jun-1990	UM20	CHCL3		41.000	UGL
59.2	03-may-1990	UM20	TRCLE		114.000	UGL
59.2	07-jun-1990	UM20	TRCLE		190.000	UGL
59.2	07-jun-1990	UW14	135TNB		0.867	UGL

Site: WELL TNT-12-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.3	25-apr-1990	99	TDS		1180000.000	UGL
50.3	07-jun-1990	99	TDS		1150000.000	UGL
50.3	25-apr-1990	SD20	PB		2.280	UGL
50.3	25-apr-1990	SD21	SE		3.410	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-12-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.3	25-apr-1990	SD22	AS		28.400	UGL
50.3	07-jun-1990	SD22	AS		17.700	UGL
50.3	25-apr-1990	SS10	BA		24.600	UGL
50.3	07-jun-1990	SS10	BA		25.100	UGL
50.3	25-apr-1990	SS10	CA		42000.000	UGL
50.3	07-jun-1990	SS10	CA		39000.000	UGL
50.3	25-apr-1990	SS10	NA		290000.000	UGL
50.3	07-jun-1990	SS10	NA		290000.000	UGL
50.3	25-apr-1990	TT10	CL		77000.000	UGL
50.3	07-jun-1990	TT10	CL		82000.000	UGL
50.3	25-apr-1990	TT10	SO4		380000.000	UGL
50.3	07-jun-1990	TT10	SO4		400000.000	UGL
50.3	25-apr-1990	UM18	B2EHP		7.180	UGL
50.3	25-apr-1990	UM18	UNK546		1.000	UGL
50.3	07-jun-1990	UM20	CHCL3		0.749	UGL
50.3	25-apr-1990	UM20	TRCLE		1.050	UGL
50.3	07-jun-1990	UM20	TRCLE		0.819	UGL
50.3	07-jun-1990	UW14	135TNB		1.120	UGL
50.3	07-jun-1990	UW14	24DNT		0.769	UGL

Site: WELL TNT-13-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
52.2	01-may-1990	99	TDS		892000.000	UGL
52.2	07-jun-1990	99	TDS		918000.000	UGL
52.2	07-jun-1990	SB01	HG		0.526	UGL
52.2	07-jun-1990	SD20	PB		9.440	UGL
52.2	01-may-1990	SD22	AS		13.600	UGL
52.2	07-jun-1990	SD22	AS		9.380	UGL
52.2	01-may-1990	SS10	BA		44.400	UGL
52.2	07-jun-1990	SS10	BA		45.600	UGL
52.2	01-may-1990	SS10	CA		34000.000	UGL
52.2	07-jun-1990	SS10	CA		32000.000	UGL
52.2	01-may-1990	SS10	NA		220000.000	UGL
52.2	07-jun-1990	SS10	NA		210000.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-13-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
52.2	01-may-1990	TT10	CL		55000.000	UGL
52.2	07-jun-1990	TT10	CL		60000.000	UGL
52.2	01-may-1990	TT10	SO4		230000.000	UGL
52.2	07-jun-1990	TT10	SO4		228000.000	UGL
52.2	07-jun-1990	UM20	CHCL3		0.533	UGL
52.2	01-may-1990	UM20	TRCLE		8.570	UGL
52.2	07-jun-1990	UM20	TRCLE		9.520	UGL

Site: WELL TNT-14-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
49.5	24-apr-1990	99	TDS		1030000.000	UGL
49.5	03-jun-1990	99	TDS		938000.000	UGL
49.5	24-apr-1990	SB01	HG		0.402	UGL
49.5	03-jun-1990	SD20	PB		3.040	UGL
49.5	24-apr-1990	SD21	SE		46.600	UGL
49.5	03-jun-1990	SD21	SE		52.200	UGL
49.5	24-apr-1990	SD22	AS		31.400	UGL
49.5	03-jun-1990	SD22	AS		27.300	UGL
49.5	24-apr-1990	SS10	BA		44.200	UGL
49.5	03-jun-1990	SS10	BA		46.200	UGL
49.5	24-apr-1990	SS10	CA		28000.000	UGL
49.5	03-jun-1990	SS10	CA		33000.000	UGL
49.5	24-apr-1990	SS10	NA		290000.000	UGL
49.5	03-jun-1990	SS10	NA		260000.000	UGL
49.5	24-apr-1990	TT10	CL		66000.000	UGL
49.5	03-jun-1990	TT10	CL		71000.000	UGL
49.5	24-apr-1990	TT10	SO4		132000.000	UGL
49.5	03-jun-1990	TT10	SO4		137000.000	UGL
49.5	24-apr-1990	UM18	UNK546		1.000	UGL
49.5	24-apr-1990	UM18	UNK557		2.000	UGL
49.5	24-apr-1990	UW14	135TNB		11.900	UGL
49.5	03-jun-1990	UW14	135TNB		13.500	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-15-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
52.0	02-may-1990	99	TDS		1310000.000	UGL
52.0	02-jun-1990	99	TDS		1320000.000	UGL
52.0	02-jun-1990	SD20	PB		3.800	UGL
52.0	02-may-1990	SD21	SE		7.450	UGL
52.0	02-jun-1990	SD21	SE		7.370	UGL
52.0	02-may-1990	SD22	AS		8.850	UGL
52.0	02-jun-1990	SD22	AS		7.140	UGL
52.0	02-may-1990	SS10	BA		36.300	UGL
52.0	02-jun-1990	SS10	BA		37.800	UGL
52.0	02-may-1990	SS10	CA		60000.000	UGL
52.0	02-jun-1990	SS10	CA		57000.000	UGL
52.0	02-may-1990	SS10	NA		35000.000	UGL
52.0	02-jun-1990	SS10	NA		270000.000	UGL
52.0	02-may-1990	TT10	CL		290000.000	UGL
52.0	02-jun-1990	TT10	CL		210000.000	UGL
52.0	02-may-1990	TT10	SO4		400000.000	UGL
52.0	02-jun-1990	TT10	SO4		280000.000	UGL
52.0	02-jun-1990	UM18	2BEETO		40.000	UGL
52.0	02-jun-1990	UW14	RDX		6.720	UGL
52.0	02-may-1990	UW14	TETRYL		1.120	UGL

Site: WELL TNT-16-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.7	02-may-1990	99	TDS		658000.000	UGL
56.7	02-jun-1990	99	TDS		692000.000	UGL
56.7	02-may-1990	SD20	PB		2.060	UGL
56.7	02-jun-1990	SD20	PB		2.280	UGL
56.7	02-may-1990	SD22	AS		7.360	UGL
56.7	02-jun-1990	SD22	AS		8.740	UGL
56.7	02-may-1990	SS10	BA		26.400	UGL
56.7	02-jun-1990	SS10	BA		22.600	UGL
56.7	02-may-1990	SS10	CA		51000.000	UGL
56.7	02-jun-1990	SS10	CA		65000.000	UGL
56.7	02-may-1990	SS10	NA		140000.000	UGL

Analytical Results for Chemical Ground Water
From: 01-jan-75 To: 22-jan-91
(Booleans LT and ND are excluded)

Site: WELL TNT-16-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
56.7	02-jun-1990	SS10	NA		100000.000	UGL
56.7	02-may-1990	TT10	CL		66000.000	UGL
56.7	02-jun-1990	TT10	CL		66000.000	UGL
56.7	02-may-1990	TT10	SO4		220000.000	UGL
56.7	02-jun-1990	TT10	SO4		220000.000	UGL
56.7	02-may-1990	UM18	UNK598		1.000	UGL

Program ended normally.$

Chemical Soil Data (for detects only) from the CSO File of the IRDMS

JMM James M. Montgomery

Consulting Engineers Inc.

INSTALLATION RESTORATION PROGRAM

CHEMICAL REPORT
Wed Mar 13 14:04:02 1991

For Parameters :

Installation = Sierra Ordnance Depot
Beginning Date = 01-jan-75
Ending Date = 13-mar-91
Media Type = Chemical Soil (CSO)
Maximum (X, Y) = (746811, 4460743)
Minimum (X, Y) = (739313, 4446795)
Booleans = N

Mar 13, 1991

Installation: Sierra Ordnance Depot
Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE ALF-01-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	13-mar-1990	99	PHENOL		0.200	UGG
10.0	17-mar-1990	99	PHENOL		0.190	UGG
20.0	17-mar-1990	99	PHENOL		0.240	UGG
25.0	17-mar-1990	99	PHENOL		1.850	UGG
35.0	17-mar-1990	99	PHENOL		0.130	UGG
70.0	17-mar-1990	99	PHENOL		0.380	UGG
80.0	17-mar-1990	99	PHENOL		0.110	UGG
90.0	17-mar-1990	99	PHENOL		0.640	UGG
95.0	17-mar-1990	99	PHENOL		0.130	UGG
50.0	17-mar-1990	99	PHENOL		0.450	UGG
5.0	13-mar-1990	JD19	AS		7.100	UGG
10.0	17-mar-1990	JD19	AS		9.500	UGG
15.0	17-mar-1990	JD19	AS		6.600	UGG
20.0	17-mar-1990	JD19	AS		8.900	UGG
25.0	17-mar-1990	JD19	AS		3.800	UGG
30.0	17-mar-1990	JD19	AS		8.100	UGG
35.0	17-mar-1990	JD19	AS		10.300	UGG
40.0	17-mar-1990	JD19	AS		3.700	UGG
45.0	17-mar-1990	JD19	AS		1.300	UGG
50.0	17-mar-1990	JD19	AS		1.400	UGG
60.0	17-mar-1990	JD19	AS		6.100	UGG
70.0	17-mar-1990	JD19	AS		3.100	UGG
80.0	17-mar-1990	JD19	AS		3.600	UGG
90.0	17-mar-1990	JD19	AS		4.300	UGG
95.0	17-mar-1990	JD19	AS		2.900	UGG
50.0	17-mar-1990	JD19	AS		1.400	UGG
15.0	17-mar-1990	JS11	CR		38.300	UGG
15.0	17-mar-1990	JS11	NI		36.700	UGG
40.0	17-mar-1990	JS11	PB		23.000	UGG
45.0	17-mar-1990	JS11	PB		10.300	UGG
90.0	17-mar-1990	JS11	PB		134.200	UGG
95.0	17-mar-1990	JS11	PB		320.100	UGG
5.0	13-mar-1990	JS11	ZN		56.300	UGG
10.0	17-mar-1990	JS11	ZN		95.800	UGG
15.0	17-mar-1990	JS11	ZN		145.800	UGG
20.0	17-mar-1990	JS11	ZN		109.500	UGG
90.0	17-mar-1990	JS11	ZN		98.200	UGG
95.0	16-mar-1990	LM18	DIACAL		0.480	UGG
30.0	16-mar-1990	LM18	UNK512		0.310	UGG
20.0	16-mar-1990	LM18	UNK613		0.250	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE ALF-02-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	13-mar-1990	99	PHENOL		0.110	UGG
10.0	18-mar-1990	99	PHENOL		0.280	UGG
30.0	18-mar-1990	99	PHENOL		0.250	UGG
35.0	18-mar-1990	99	PHENOL		0.190	UGG
40.0	18-mar-1990	99	PHENOL		0.150	UGG
45.0	18-mar-1990	99	PHENOL		0.110	UGG
70.0	18-mar-1990	99	PHENOL		0.180	UGG
80.0	18-mar-1990	99	PHENOL		0.200	UGG
89.0	18-mar-1990	99	PHENOL		0.240	UGG
5.0	13-mar-1990	99	THPCDD		0.000	UGG
5.0	13-mar-1990	99	TOCDD		0.001	UGG
5.0	13-mar-1990	99	TOCDF		0.000	UGG
30.0	18-mar-1990	JD15	SE		0.500	UGG
5.0	13-mar-1990	JD19	AS		9.900	UGG
10.0	18-mar-1990	JD19	AS		3.600	UGG
15.0	18-mar-1990	JD19	AS		4.600	UGG
20.0	18-mar-1990	JD19	AS		3.700	UGG
25.0	18-mar-1990	JD19	AS		2.700	UGG
30.0	18-mar-1990	JD19	AS		14.600	UGG
35.0	18-mar-1990	JD19	AS		3.500	UGG
40.0	18-mar-1990	JD19	AS		4.800	UGG
45.0	18-mar-1990	JD19	AS		1.500	UGG
50.0	18-mar-1990	JD19	AS		2.500	UGG
60.0	18-mar-1990	JD19	AS		6.700	UGG
70.0	18-mar-1990	JD19	AS		4.500	UGG
80.0	18-mar-1990	JD19	AS		4.000	UGG
89.0	18-mar-1990	JD19	AS		2.700	UGG
50.0	18-mar-1990	JD19	AS		1.600	UGG
5.0	13-mar-1990	JS11	CR		24.400	UGG
5.0	13-mar-1990	JS11	PB		84.800	UGG
10.0	18-mar-1990	JS11	PB		55.400	UGG
15.0	18-mar-1990	JS11	PB		7.100	UGG
30.0	18-mar-1990	JS11	PB		87.300	UGG
35.0	18-mar-1990	JS11	PB		33.000	UGG
40.0	18-mar-1990	JS11	PB		15.700	UGG
50.0	18-mar-1990	JS11	PB		12.200	UGG
60.0	18-mar-1990	JS11	PB		23.800	UGG
70.0	18-mar-1990	JS11	PB		134.200	UGG
80.0	18-mar-1990	JS11	PB		62.900	UGG
5.0	13-mar-1990	JS11	ZN		140.700	UGG
30.0	18-mar-1990	JS11	ZN		111.300	UGG
70.0	18-mar-1990	JS11	ZN		85.200	UGG
80.0	18-mar-1990	JS11	ZN		82.700	UGG
20.0	18-mar-1990	LH10	HPCL		0.010	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE ALF-02-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
60.0	18-mar-1990	LM18	4H3MBA		0.790	UGG
70.0	18-mar-1990	LM18	4H3MBA		0.830	UGG
50.0	18-mar-1990	LM19	MEC6H5		0.000	UGG
50.0	18-mar-1990	LM19	UNK071		0.320	UGG
50.0	18-mar-1990	LM19	UNK076		0.020	UGG

Site: BORE ALF-03-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	13-mar-1990	99	PHENOL		0.260	UGG
10.0	19-mar-1990	99	PHENOL		0.300	UGG
15.0	19-mar-1990	99	PHENOL		0.120	UGG
20.0	19-mar-1990	99	PHENOL		0.160	UGG
25.0	19-mar-1990	99	PHENOL		0.110	UGG
40.0	19-mar-1990	99	PHENOL		0.120	UGG
90.0	19-mar-1990	99	PHENOL		0.140	UGG
5.0	13-mar-1990	99	TCDD		0.000	UGG
5.0	13-mar-1990	99	TCDF		0.000	UGG
5.0	13-mar-1990	99	THCDF		0.000	UGG
5.0	13-mar-1990	99	THPCDD		0.000	UGG
5.0	13-mar-1990	99	THPCDF		0.000	UGG
5.0	13-mar-1990	99	TOCDD		0.000	UGG
5.0	13-mar-1990	99	TPCDF		0.000	UGG
5.0	13-mar-1990	JD15	SE		0.600	UGG
30.0	19-mar-1990	JD15	SE		0.600	UGG
5.0	13-mar-1990	JD19	AS		11.200	UGG
10.0	19-mar-1990	JD19	AS		3.900	UGG
15.0	19-mar-1990	JD19	AS		3.000	UGG
20.0	19-mar-1990	JD19	AS		3.400	UGG
25.0	19-mar-1990	JD19	AS		4.700	UGG
30.0	19-mar-1990	JD19	AS		15.600	UGG
35.0	19-mar-1990	JD19	AS		9.800	UGG
40.0	19-mar-1990	JD19	AS		5.500	UGG
45.0	19-mar-1990	JD19	AS		3.400	UGG
50.0	19-mar-1990	JD19	AS		1.300	UGG
60.0	19-mar-1990	JD19	AS		4.000	UGG
70.0	19-mar-1990	JD19	AS		2.200	UGG
80.0	19-mar-1990	JD19	AS		4.200	UGG
90.0	19-mar-1990	JD19	AS		5.300	UGG
30.0	19-mar-1990	JD19	AS		0.800	UGG
5.0	13-mar-1990	JS11	CD		6.200	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE ALF-03-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	13-mar-1990	JS11	CR		48.400	UGG
5.0	13-mar-1990	JS11	CU		446.500	UGG
5.0	13-mar-1990	JS11	NI		43.600	UGG
5.0	13-mar-1990	JS11	PB		440.200	UGG
10.0	19-mar-1990	JS11	PB		37.800	UGG
5.0	13-mar-1990	JS11	ZN		1091.200	UGG
30.0	19-mar-1990	JS11	ZN		92.800	UGG
10.0	19-mar-1990	JS11	ZN		132.000	UGG
20.0	19-mar-1990	LH10	HPCL		0.010	UGG
45.0	19-mar-1990	LM19	ACET		0.020	UGG
5.0	13-mar-1990	LM19	CCL3F		0.020	UGG
50.0	19-mar-1990	LM19	MEC6H5		0.000	UGG
5.0	13-mar-1990	LM19	TRCLE		0.020	UGG
10.0	19-mar-1990	LM19	TRCLE		0.000	UGG
50.0	19-mar-1990	LM19	UNK071		0.210	UGG
50.0	19-mar-1990	LM19	UNK076		0.020	UGG

Site: BORE ALF-04-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
30.0	18-mar-1990	JD15	SE		0.500	UGG
5.0	13-mar-1990	JD19	AS		23.100	UGG
10.0	18-mar-1990	JD19	AS		4.800	UGG
15.0	18-mar-1990	JD19	AS		3.100	UGG
20.0	18-mar-1990	JD19	AS		4.200	UGG
25.0	18-mar-1990	JD19	AS		4.900	UGG
30.0	18-mar-1990	JD19	AS		14.000	UGG
35.0	18-mar-1990	JD19	AS		3.900	UGG
40.0	18-mar-1990	JD19	AS		2.300	UGG
45.0	18-mar-1990	JD19	AS		1.800	UGG
50.0	19-mar-1990	JD19	AS		2.600	UGG
60.0	19-mar-1990	JD19	AS		6.000	UGG
70.0	19-mar-1990	JD19	AS		9.000	UGG
80.0	19-mar-1990	JD19	AS		4.900	UGG
85.0	19-mar-1990	JD19	AS		6.100	UGG
50.0	19-mar-1990	JD19	AS		1.400	UGG
30.0	18-mar-1990	JS11	ZN		91.700	UGG
85.0	19-mar-1990	JS11	ZN		60.300	UGG
20.0	18-mar-1990	LM18	UNK529		0.310	UGG
45.0	18-mar-1990	LM18	UNK592		0.310	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE ALF-04-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
70.0	19-mar-1990	LM19	ACET		0.020	UGG
85.0	19-mar-1990	LM19	MEC6H5		0.000	UGG
5.0	13-mar-1990	LM19	UNK070		0.010	UGG
85.0	19-mar-1990	LM19	UNK071		0.220	UGG
85.0	19-mar-1990	LM19	UNK076		0.030	UGG

Site: BORE CCB-01-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
15.0	13-apr-1990	99	PHENOL		0.180	UGG
25.0	13-apr-1990	99	PHENOL		0.110	UGG
60.0	13-apr-1990	99	PHENOL		4.540	UGG
70.0	13-apr-1990	99	PHENOL		4.700	UGG
5.0	14-mar-1990	JD19	AS		3.500	UGG
50.0	13-apr-1990	JD19	AS		3.100	UGG
10.0	13-apr-1990	JD19	AS		4.900	UGG
15.0	13-apr-1990	JD19	AS		4.700	UGG
20.0	13-apr-1990	JD19	AS		2.700	UGG
25.0	13-apr-1990	JD19	AS		10.200	UGG
30.0	13-apr-1990	JD19	AS		8.400	UGG
35.0	13-apr-1990	JD19	AS		2.200	UGG
40.0	13-apr-1990	JD19	AS		2.100	UGG
45.0	13-apr-1990	JD19	AS		2.900	UGG
50.0	13-apr-1990	JD19	AS		3.500	UGG
60.0	13-apr-1990	JD19	AS		4.800	UGG
70.0	13-apr-1990	JD19	AS		13.300	UGG
88.0	13-apr-1990	JD19	AS		3.700	UGG
25.0	13-apr-1990	JS11	ZN		69.600	UGG
30.0	13-apr-1990	JS11	ZN		76.800	UGG
70.0	13-apr-1990	JS11	ZN		92.500	UGG
5.0	14-mar-1990	LH10	CLDAN		1.040	UGG
15.0	13-apr-1990	LH10	CLDAN		0.110	UGG
5.0	14-mar-1990	LH10	HPCL		0.010	UGG
5.0	14-mar-1990	LH10	HPCLE		0.010	UGG
10.0	13-apr-1990	LM18	12EPCH		0.100	UGG
15.0	13-apr-1990	LM18	12EPCH		0.100	UGG
20.0	13-apr-1990	LM18	12EPCH		0.100	UGG
25.0	13-apr-1990	LM18	12EPCH		0.110	UGG
30.0	13-apr-1990	LM18	12EPCH		0.130	UGG
35.0	13-apr-1990	LM18	12EPCH		0.110	UGG
40.0	13-apr-1990	LM18	12EPCH		0.100	UGG

Site: BORE CCB-01-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
45.0	13-apr-1990	LM18	12EPCH		0.110	UGG
50.0	13-apr-1990	LM18	12EPCH		0.100	UGG
60.0	13-apr-1990	LM18	12EPCH		0.120	UGG
70.0	13-apr-1990	LM18	12EPCH		0.120	UGG
88.0	13-apr-1990	LM18	12EPCH		0.230	UGG
10.0	13-apr-1990	LM18	2CHE1L		0.050	UGG
30.0	13-apr-1990	LM18	2CHE1L		0.130	UGG
10.0	13-apr-1990	LM18	2CHE1O		0.050	UGG
30.0	13-apr-1990	LM18	2CHE1O		0.080	UGG
60.0	13-apr-1990	LM18	UNK533		0.110	UGG
88.0	13-apr-1990	LM18	UNK533		0.110	UGG
10.0	13-apr-1990	LM18	UNK539		0.060	UGG
25.0	13-apr-1990	LM18	UNK585		0.320	UGG
5.0	14-mar-1990	LM19	CCL3F		0.010	UGG
25.0	13-apr-1990	LM19	UNK170		0.010	UGG
30.0	13-apr-1990	LM19	UNK170		0.010	UGG
35.0	13-apr-1990	LM19	UNK170		0.010	UGG
40.0	13-apr-1990	LM19	UNK170		0.010	UGG
45.0	13-apr-1990	LM19	UNK170		0.010	UGG
70.0	13-apr-1990	LM19	UNK170		0.010	UGG
88.0	13-apr-1990	LM19	UNK171		0.010	UGG
35.0	13-apr-1990	LM19	UNK175		0.010	UGG

Site: BORE CCB-02-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
10.0	12-apr-1990	99	PHENOL		0.220	UGG
15.0	12-apr-1990	99	PHENOL		0.110	UGG
20.0	12-apr-1990	99	PHENOL		0.100	UGG
25.0	12-apr-1990	99	PHENOL		0.110	UGG
60.0	12-apr-1990	99	PHENOL		0.120	UGG
70.0	13-apr-1990	99	PHENOL		0.210	UGG
80.0	13-apr-1990	99	PHENOL		0.160	UGG
5.0	14-mar-1990	JD19	AS		2.600	UGG
20.0	12-apr-1990	JD19	AS		4.800	UGG
10.0	12-apr-1990	JD19	AS		4.300	UGG
15.0	12-apr-1990	JD19	AS		4.700	UGG
20.0	12-apr-1990	JD19	AS		4.900	UGG
25.0	12-apr-1990	JD19	AS		7.700	UGG
30.0	12-apr-1990	JD19	AS		12.200	UGG
35.0	12-apr-1990	JD19	AS		2.300	UGG
40.0	12-apr-1990	JD19	AS		1.900	UGG
45.0	12-apr-1990	JD19	AS		21.500	UGG

Site: BORE CCB-02-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.0	12-apr-1990	JD19	AS		37.100	UGG
60.0	12-apr-1990	JD19	AS		3.200	UGG
80.0	13-apr-1990	JD19	AS		5.100	UGG
70.0	13-apr-1990	JD19	AS		3.000	UGG
80.0	13-apr-1990	JD19	AS		3.600	UGG
25.0	12-apr-1990	JS11	CR		22.500	UGG
35.0	12-apr-1990	JS11	CR		31.100	UGG
25.0	12-apr-1990	JS11	NI		27.400	UGG
35.0	12-apr-1990	JS11	NI		30.400	UGG
80.0	13-apr-1990	JS11	PB		6.700	UGG
20.0	12-apr-1990	JS11	ZN		56.700	UGG
25.0	12-apr-1990	JS11	ZN		87.400	UGG
30.0	12-apr-1990	JS11	ZN		107.800	UGG
35.0	12-apr-1990	JS11	ZN		57.000	UGG
45.0	12-apr-1990	JS11	ZN		91.100	UGG
50.0	12-apr-1990	JS11	ZN		73.300	UGG
60.0	12-apr-1990	JS11	ZN		75.170	UGG
80.0	13-apr-1990	JS11	ZN		109.400	UGG
80.0	13-apr-1990	JS11	ZN		76.600	UGG
5.0	14-mar-1990	LH10	CLDAN		0.580	UGG
10.0	12-apr-1990	LH10	CLDAN		0.060	UGG
5.0	14-mar-1990	LH10	HPCL		0.010	UGG
5.0	14-mar-1990	LM19	CCL3F		0.010	UGG
80.0	13-apr-1990	LM19	UNK170		0.010	UGG
80.0	13-apr-1990	LM19	UNK170		0.010	UGG
70.0	13-apr-1990	LM19	UNK171		0.010	UGG
80.0	13-apr-1990	LM19	UNK176		0.010	UGG

Site: BORE CCB-03-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
10.0	12-apr-1990	99	PHENOL		2.190	UGG
50.0	12-apr-1990	99	PHENOL		0.210	UGG
60.0	12-apr-1990	99	PHENOL		0.270	UGG
70.0	12-apr-1990	99	PHENOL		0.130	UGG
80.0	12-apr-1990	99	PHENOL		0.150	UGG
5.0	14-mar-1990	99	TOCDD		0.001	UGG
5.0	14-mar-1990	JD19	AS		2.900	UGG
10.0	12-apr-1990	JD19	AS		15.[illegible]	UGG
15.0	12-apr-1990	JD19	AS		15.700	UGG
20.0	12-apr-1990	JD19	AS		6.400	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE CCB-03-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
25.0	12-apr-1990	JD19	AS		6.000	UGG
30.0	12-apr-1990	JD19	AS		19.000	UGG
35.0	12-apr-1990	JD19	AS		2.900	UGG
40.0	12-apr-1990	JD19	AS		3.400	UGG
45.0	12-apr-1990	JD19	AS		2.000	UGG
50.0	12-apr-1990	JD19	AS		16.300	UGG
60.0	12-apr-1990	JD19	AS		6.400	UGG
70.0	12-apr-1990	JD19	AS		8.000	UGG
80.0	12-apr-1990	JD19	AS		4.200	UGG
88.0	12-apr-1990	JD19	AS		5.700	UGG
35.0	12-apr-1990	JD19	AS		2.000	UGG
15.0	12-apr-1990	JS11	ZN		69.000	UGG
20.0	12-apr-1990	JS11	ZN		95.900	UGG
25.0	12-apr-1990	JS11	ZN		64.500	UGG
30.0	12-apr-1990	JS11	ZN		97.300	UGG
50.0	12-apr-1990	JS11	ZN		127.700	UGG
70.0	12-apr-1990	JS11	ZN		73.100	UGG
80.0	12-apr-1990	JS11	ZN		108.400	UGG
88.0	12-apr-1990	JS11	ZN		102.000	UGG
15.0	12-apr-1990	LM18	12EPCH		0.100	UGG
20.0	12-apr-1990	LM18	12EPCH		0.110	UGG
25.0	12-apr-1990	LM18	12EPCH		0.110	UGG
30.0	12-apr-1990	LM18	12EPCH		0.240	UGG
35.0	12-apr-1990	LM18	12EPCH		0.120	UGG
40.0	12-apr-1990	LM18	12EPCH		0.110	UGG
45.0	12-apr-1990	LM18	12EPCH		0.110	UGG
60.0	12-apr-1990	LM18	12EPCH		0.230	UGG
70.0	12-apr-1990	LM18	12EPCH		0.240	UGG
80.0	12-apr-1990	LM18	12EPCH		0.240	UGG
35.0	12-apr-1990	LM18	12EPCH		0.110	UGG
10.0	12-apr-1990	LM18	MEC6H5		0.720	UGG
15.0	12-apr-1990	LM18	MEC6H5		0.310	UGG
20.0	12-apr-1990	LM18	MEC6H5		0.110	UGG
70.0	12-apr-1990	LM18	MEC6H5		0.080	UGG
5.0	14-mar-1990	LM19	CCL3F		0.010	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE CCB-04-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
90.0	12-apr-1990	99	PHENOL		0.150	UGG
5.0	11-apr-1990	JD19	AS		13.300	UGG
50.0	11-apr-1990	JD19	AS		2.100	UGG
5.0	11-apr-1990	JD19	AS		10.200	UGG
10.0	11-apr-1990	JD19	AS		6.500	UGG
15.0	11-apr-1990	JD19	AS		3.700	UGG
20.0	11-apr-1990	JD19	AS		5.100	UGG
25.0	11-apr-1990	JD19	AS		5.700	UGG
30.0	11-apr-1990	JD19	AS		13.800	UGG
35.0	11-apr-1990	JD19	AS		6.000	UGG
40.0	11-apr-1990	JD19	AS		3.400	UGG
45.0	11-apr-1990	JD19	AS		1.900	UGG
50.0	11-apr-1990	JD19	AS		2.200	UGG
60.0	11-apr-1990	JD19	AS		2.300	UGG
70.0	12-apr-1990	JD19	AS		5.200	UGG
80.0	12-apr-1990	JD19	AS		2.700	UGG
90.0	12-apr-1990	JD19	AS		5.700	UGG
30.0	11-apr-1990	JS11	ZN		107.000	UGG
35.0	11-apr-1990	JS11	ZN		104.700	UGG
20.0	11-apr-1990	JS11	ZN		130.200	UGG
25.0	11-apr-1990	JS11	ZN		139.400	UGG
90.0	12-apr-1990	JS11	ZN		77.200	UGG
5.0	11-apr-1990	LM18	12EPCH		0.100	UGG
50.0	11-apr-1990	LM18	12EPCH		0.090	UGG
70.0	12-apr-1990	LM18	12EPCH		0.110	UGG
80.0	12-apr-1990	LM18	12EPCH		0.120	UGG
90.0	12-apr-1990	LM18	12EPCH		0.130	UGG
70.0	12-apr-1990	LM18	5M2HXO		0.860	UGG
80.0	12-apr-1990	LM18	5M2HXO		0.820	UGG

Site: BORE CCB-05-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
30.0	11-apr-1990	99	PHENOL		0.270	UGG
5.0	14-mar-1990	99	TOCDD		0.001	UGG
5.0	15-mar-1990	99	TOCDD		0.001	UGG
5.0	15-mar-1990	JD19	AS		6.400	UGG
10.0	11-apr-1990	JD19	AS		2.800	UGG
15.0	11-apr-1990	JD19	AS		3.300	UGG
20.0	11-apr-1990	JD19	AS		3.100	UGG
25.0	11-apr-1990	JD19	AS		1.800	UGG

Site: BORE CCB-05-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
30.0	11-apr-1990	JD19	AS		15.600	UGG
35.0	11-apr-1990	JD19	AS		4.900	UGG
40.0	11-apr-1990	JD19	AS		3.100	UGG
45.0	11-apr-1990	JD19	AS		1.200	UGG
50.0	11-apr-1990	JD19	AS		2.200	UGG
60.0	11-apr-1990	JD19	AS		2.900	UGG
30.0	11-apr-1990	JD19	AS		16.000	UGG
30.0	11-apr-1990	JS11	ZN		72.700	UGG
50.0	11-apr-1990	JS11	ZN		63.000	UGG
30.0	11-apr-1990	JS11	ZN		66.900	UGG
20.0	11-apr-1990	LM18	12EPCH		0.080	UGG
25.0	11-apr-1990	LM18	12EPCH		0.200	UGG
30.0	11-apr-1990	LM18	12EPCH		0.240	UGG
35.0	11-apr-1990	LM18	12EPCH		0.210	UGG
40.0	11-apr-1990	LM18	12EPCH		0.220	UGG
45.0	11-apr-1990	LM18	12EPCH		0.310	UGG
50.0	11-apr-1990	LM18	12EPCH		0.220	UGG
60.0	11-apr-1990	LM18	12EPCH		0.210	UGG
30.0	11-apr-1990	LM18	12EPCH		0.220	UGG
25.0	11-apr-1990	LM18	5M2HXO		0.200	UGG
30.0	11-apr-1990	LM18	5M2HXO		0.240	UGG
40.0	11-apr-1990	LM18	5M2HXO		0.110	UGG
45.0	11-apr-1990	LM18	5M2HXO		0.210	UGG
50.0	11-apr-1990	LM18	5M2HXO		0.220	UGG
30.0	11-apr-1990	LM18	5M2HXO		0.220	UGG
35.0	11-apr-1990	LM18	B2EHP		2.030	UGG
35.0	11-apr-1990	LM18	C16ABE		0.520	UGG
35.0	11-apr-1990	LM18	C18ABE		0.310	UGG

Site: BORE DMO-06-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
20.0	26-mar-1990	JD19	AS		5.800	UGG
25.0	26-mar-1990	JD19	AS		3.500	UGG
30.0	26-mar-1990	JD19	AS		1.500	UGG
35.0	26-mar-1990	JD19	AS		1.100	UGG
40.0	26-mar-1990	JD19	AS		6.300	UGG
45.0	26-mar-1990	JD19	AS		2.500	UGG
50.0	26-mar-1990	JD19	AS		4.200	UGG
60.0	26-mar-1990	JD19	AS		8.700	UGG
70.0	26-mar-1990	JD19	AS		5.300	UGG
80.0	26-mar-1990	JD19	AS		4.300	UGG
90.0	26-mar-1990	JD19	AS		8.200	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE DMO-06-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
95.0	26-mar-1990	JD19	AS		4.500	UGG
50.0	26-mar-1990	JD19	AS		6.900	UGG
10.0	26-mar-1990	JD19	AS		5.100	UGG
15.0	26-mar-1990	JD19	AS		17.100	UGG
10.0	26-mar-1990	JS11	BA		82.300	UGG
15.0	26-mar-1990	JS11	BA		399.800	UGG
20.0	26-mar-1990	JS11	BA		57.000	UGG
25.0	26-mar-1990	JS11	BA		117.900	UGG
30.0	26-mar-1990	JS11	BA		56.000	UGG
40.0	26-mar-1990	JS11	BA		111.600	UGG
45.0	26-mar-1990	JS11	BA		133.200	UGG
50.0	26-mar-1990	JS11	BA		207.100	UGG
60.0	26-mar-1990	JS11	BA		102.700	UGG
70.0	26-mar-1990	JS11	BA		251.900	UGG
80.0	26-mar-1990	JS11	BA		53.900	UGG
90.0	26-mar-1990	JS11	BA		234.400	UGG
95.0	26-mar-1990	JS11	BA		292.300	UGG
50.0	26-mar-1990	JS11	BA		218.500	UGG
15.0	26-mar-1990	JS11	CO		29.200	UGG
15.0	26-mar-1990	JS11	MO		2.600	UGG
70.0	26-mar-1990	JS11	MO		3.400	UGG
50.0	26-mar-1990	JS11	MO		6.100	UGG
15.0	26-mar-1990	JS11	PB		9.000	UGG
10.0	26-mar-1990	JS11	V		23.100	UGG
15.0	26-mar-1990	JS11	V		120.500	UGG
25.0	26-mar-1990	JS11	V		43.100	UGG
40.0	26-mar-1990	JS11	V		41.000	UGG
45.0	26-mar-1990	JS11	V		38.700	UGG
50.0	26-mar-1990	JS11	V		87.900	UGG
60.0	26-mar-1990	JS11	V		30.600	UGG
70.0	26-mar-1990	JS11	V		66.000	UGG
80.0	26-mar-1990	JS11	V		37.600	UGG
90.0	26-mar-1990	JS11	V		60.700	UGG
95.0	26-mar-1990	JS11	V		65.000	UGG
50.0	26-mar-1990	JS11	V		84.600	UGG
15.0	26-mar-1990	JS11	ZN		157.900	UGG
50.0	26-mar-1990	JS11	ZN		73.400	UGG
90.0	26-mar-1990	JS11	ZN		72.800	UGG
95.0	26-mar-1990	JS11	ZN		69.400	UGG
50.0	26-mar-1990	JS11	ZN		79.200	UGG
15.0	26-mar-1990	LM18	B2EHP		1.550	UGG
40.0	26-mar-1990	LM18	B2EHP		1.800	UGG
70.0	26-mar-1990	LM18	B2EHP		1.030	UGG
35.0	26-mar-1990	LM18	UNK573		0.100	UGG
40.0	26-mar-1990	LM18	UNK614		0.110	UGG

Site: BORE DMO-06-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.0	26-mar-1990	LM19	UNK071		0.020	UGG

Site: BORE DMO-07-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
10.0	26-mar-1990	JD19	AS		5.200	UGG
15.0	26-mar-1990	JD19	AS		6.600	UGG
20.0	26-mar-1990	JD19	AS		2.600	UGG
25.0	26-mar-1990	JD19	AS		6.600	UGG
30.0	26-mar-1990	JD19	AS		1.300	UGG
35.0	26-mar-1990	JD19	AS		1.500	UGG
5.0	26-mar-1990	JD19	AS		18.900	UGG
45.0	29-mar-1990	JD19	AS		3.800	UGG
50.0	29-mar-1990	JD19	AS		3.700	UGG
60.0	29-mar-1990	JD19	AS		13.900	UGG
70.0	29-mar-1990	JD19	AS		6.000	UGG
80.0	29-mar-1990	JD19	AS		6.100	UGG
90.0	29-mar-1990	JD19	AS		14.400	UGG
50.0	29-mar-1990	JD19	AS		6.200	UGG
90.0	29-mar-1990	JD19	AS		4.400	UGG
5.0	26-mar-1990	JS11	BA		409.800	UGG
10.0	26-mar-1990	JS11	BA		76.600	UGG
15.0	26-mar-1990	JS11	BA		270.500	UGG
20.0	26-mar-1990	JS11	BA		62.200	UGG
25.0	26-mar-1990	JS11	BA		113.100	UGG
30.0	26-mar-1990	JS11	BA		155.000	UGG
35.0	26-mar-1990	JS11	BA		54.600	UGG
80.0	29-mar-1990	JS11	BA		56.900	UGG
90.0	29-mar-1990	JS11	BA		137.600	UGG
45.0	29-mar-1990	JS11	BA		165.400	UGG
50.0	29-mar-1990	JS11	BA		264.700	UGG
60.0	29-mar-1990	JS11	BA		186.400	UGG
70.0	29-mar-1990	JS11	BA		166.400	UGG
50.0	29-mar-1990	JS11	BA		233.100	UGG
90.0	29-mar-1990	JS11	BA		173.000	UGG
25.0	26-mar-1990	JS11	MO		2.200	UGG
50.0	29-mar-1990	JS11	MO		2.500	UGG
70.0	29-mar-1990	JS11	MO		2.100	UGG
50.0	29-mar-1990	JS11	MO		2.300	UGG
90.0	29-mar-1990	JS11	PB		68.300	UGG
5.0	26-mar-1990	JS11	V		61.500	UGG
15.0	26-mar-1990	JS11	V		81.700	UGG
20.0	26-mar-1990	JS11	V		35.200	UGG
25.0	26-mar-1990	JS11	V		37.500	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE DHO-07-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
30.0	26-mar-1990	JS11	V		23.900	UGG
35.0	26-mar-1990	JS11	V		26.000	UGG
80.0	29-mar-1990	JS11	V		23.100	UGG
90.0	29-mar-1990	JS11	V		48.800	UGG
45.0	29-mar-1990	JS11	V		45.700	UGG
50.0	29-mar-1990	JS11	V		75.000	UGG
60.0	29-mar-1990	JS11	V		43.500	UGG
70.0	29-mar-1990	JS11	V		35.100	UGG
50.0	29-mar-1990	JS11	V		76.400	UGG
90.0	29-mar-1990	JS11	V		61.000	UGG
5.0	26-mar-1990	JS11	ZN		77.200	UGG
15.0	26-mar-1990	JS11	ZN		104.700	UGG
90.0	29-mar-1990	JS11	ZN		61.800	UGG
50.0	29-mar-1990	JS11	ZN		85.300	UGG
50.0	29-mar-1990	JS11	ZN		88.700	UGG
90.0	29-mar-1990	JS11	ZN		65.100	UGG
5.0	26-mar-1990	JY02	CRHEX		1.100	UGG
10.0	26-mar-1990	LH10	HPCL		0.010	UGG
25.0	26-mar-1990	LM18	B2EHP		17.490	UGG
25.0	26-mar-1990	LM18	HXADOE		0.320	UGG
5.0	26-mar-1990	LM18	UNK614		0.110	UGG
50.0	29-mar-1990	LM18	UNK614		0.090	UGG
90.0	29-mar-1990	LM19	TRCLE		0.000	UGG
35.0	26-mar-1990	LM19	UNK071		0.020	UGG
25.0	26-mar-1990	LM19	UNK071		0.020	UGG
20.0	26-mar-1990	LM19	UNK071		0.010	UGG

Site: BORE DHO-08-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
25.0	27-mar-1990	99	HPCL		0.010	UGG
10.0	27-mar-1990	JB01	HG		0.100	UGG
5.0	27-mar-1990	JD19	AS		11.400	UGG
10.0	27-mar-1990	JD19	AS		5.500	UGG
15.0	27-mar-1990	JD19	AS		4.200	UGG
20.0	27-mar-1990	JD19	AS		4.100	UGG
25.0	27-mar-1990	JD19	AS		3.200	UGG
30.0	27-mar-1990	JD19	AS		2.200	UGG
35.0	27-mar-1990	JD19	AS		1.800	UGG

Site: BORE DMO-08-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
40.0	27-mar-1990	JD19	AS		4.400	UGG
45.0	27-mar-1990	JD19	AS		3.700	UGG
50.0	27-mar-1990	JD19	AS		4.700	UGG
60.0	27-mar-1990	JD19	AS		11.700	UGG
70.0	27-mar-1990	JD19	AS		9.300	UGG
80.0	27-mar-1990	JD19	AS		7.400	UGG
90.0	27-mar-1990	JD19	AS		6.300	UGG
95.0	27-mar-1990	JD19	AS		2.800	UGG
50.0	27-mar-1990	JD19	AS		4.900	UGG
5.0	27-mar-1990	JS11	BA		245.800	UGG
15.0	27-mar-1990	JS11	BA		163.900	UGG
25.0	27-mar-1990	JS11	BA		143.400	UGG
30.0	27-mar-1990	JS11	BA		73.400	UGG
35.0	27-mar-1990	JS11	BA		57.400	UGG
40.0	27-mar-1990	JS11	BA		110.600	UGG
45.0	27-mar-1990	JS11	BA		164.300	UGG
50.0	27-mar-1990	JS11	BA		121.000	UGG
60.0	27-mar-1990	JS11	BA		92.600	UGG
70.0	27-mar-1990	JS11	BA		128.700	UGG
90.0	27-mar-1990	JS11	BA		136.000	UGG
95.0	27-mar-1990	JS11	BA		203.200	UGG
50.0	27-mar-1990	JS11	BA		138.100	UGG
50.0	27-mar-1990	JS11	MO		2.400	UGG
60.0	27-mar-1990	JS11	MO		2.300	UGG
70.0	27-mar-1990	JS11	MO		2.200	UGG
50.0	27-mar-1990	JS11	MO		2.300	UGG
5.0	27-mar-1990	JS11	PB		7.500	UGG
25.0	27-mar-1990	JS11	PB		12.000	UGG
70.0	27-mar-1990	JS11	PB		13.600	UGG
90.0	27-mar-1990	JS11	PB		21.500	UGG
5.0	27-mar-1990	JS11	V		55.100	UGG
10.0	27-mar-1990	JS11	V		20.900	UGG
15.0	27-mar-1990	JS11	V		57.500	UGG
25.0	27-mar-1990	JS11	V		35.800	UGG
30.0	27-mar-1990	JS11	V		27.100	UGG
40.0	27-mar-1990	JS11	V		36.400	UGG
45.0	27-mar-1990	JS11	V		38.400	UGG
50.0	27-mar-1990	JS11	V		46.200	UGG
60.0	27-mar-1990	JS11	V		37.000	UGG
70.0	27-mar-1990	JS11	V		32.700	UGG
90.0	27-mar-1990	JS11	V		40.800	UGG
95.0	27-mar-1990	JS11	V		52.900	UGG
50.0	27-mar-1990	JS11	V		58.100	UGG
5.0	27-mar-1990	JS11	ZN		67.200	UGG
15.0	27-mar-1990	JS11	ZN		68.500	UGG
45.0	27-mar-1990	JS11	ZN		59.300	UGG
95.0	27-mar-1990	JS11	ZN		64.200	UGG

Site: BORE DHO-08-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.0	27-mar-1990	JS11	ZN		58.500	UGG
15.0	27-mar-1990	LM18	12EPCH		0.110	UGG
20.0	27-mar-1990	LM18	12EPCH		0.100	UGG
35.0	27-mar-1990	LM18	12EPCH		0.080	UGG
40.0	27-mar-1990	LM18	UNK512		0.110	UGG
50.0	27-mar-1990	LM18	UNK512		0.070	UGG
60.0	27-mar-1990	LM18	UNK512		0.100	UGG
70.0	27-mar-1990	LM18	UNK512		0.100	UGG
80.0	27-mar-1990	LM18	UNK512		0.100	UGG
90.0	27-mar-1990	LM18	UNK512		0.110	UGG
95.0	27-mar-1990	LM18	UNK512		0.120	UGG
50.0	27-mar-1990	LM18	UNK512		0.110	UGG
35.0	27-mar-1990	LM19	MEC6H5		0.000	UGG
70.0	27-mar-1990	LM19	MEC6H5		0.000	UGG
5.0	27-mar-1990	LM19	TRCLE		0.020	UGG
15.0	27-mar-1990	LM19	UNK071		0.010	UGG
10.0	27-mar-1990	LM19	UNK071		0.020	UGG
5.0	27-mar-1990	LM19	UNK071		0.010	UGG

Site: BORE DHO-09-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	28-mar-1990	JD19	AS		14.100	UGG
10.0	28-mar-1990	JD19	AS		6.600	UGG
15.0	28-mar-1990	JD19	AS		7.100	UGG
20.0	28-mar-1990	JD19	AS		2.900	UGG
25.0	28-mar-1990	JD19	AS		1.700	UGG
30.0	28-mar-1990	JD19	AS		2.700	UGG
35.0	28-mar-1990	JD19	AS		1.600	UGG
40.0	28-mar-1990	JD19	AS		2.600	UGG
45.0	28-mar-1990	JD19	AS		3.400	UGG
50.0	28-mar-1990	JD19	AS		7.500	UGG
60.0	28-mar-1990	JD19	AS		5.800	UGG
70.0	28-mar-1990	JD19	AS		14.500	UGG
80.0	28-mar-1990	JD19	AS		3.500	UGG
90.0	28-mar-1990	JD19	AS		4.300	UGG
50.0	28-mar-1990	JD19	AS		7.500	UGG
5.0	28-mar-1990	JS11	BA		277.500	UGG
10.0	28-mar-1990	JS11	BA		105.800	UGG
15.0	28-mar-1990	JS11	BA		139.100	UGG
25.0	28-mar-1990	JS11	BA		135.100	UGG
30.0	28-mar-1990	JS11	BA		81.700	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE DMO-09-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
40.0	28-mar-1990	JS11	BA		90.900	UGG
45.0	28-mar-1990	JS11	BA		109.300	UGG
50.0	28-mar-1990	JS11	BA		181.300	UGG
60.0	28-mar-1990	JS11	BA		78.400	UGG
70.0	28-mar-1990	JS11	BA		223.600	UGG
80.0	28-mar-1990	JS11	BA		61.800	UGG
90.0	28-mar-1990	JS11	BA		196.500	UGG
50.0	28-mar-1990	JS11	BA		99.900	UGG
50.0	28-mar-1990	JS11	MO		2.800	UGG
70.0	28-mar-1990	JS11	MO		4.700	UGG
50.0	28-mar-1990	JS11	MO		2.300	UGG
25.0	28-mar-1990	JS11	PB		19.200	UGG
30.0	28-mar-1990	JS11	PB		21.800	UGG
50.0	28-mar-1990	JS11	PB		7.700	UGG
90.0	28-mar-1990	JS11	PB		8.700	UGG
5.0	28-mar-1990	JS11	V		53.500	UGG
10.0	28-mar-1990	JS11	V		30.200	UGG
15.0	28-mar-1990	JS11	V		52.900	UGG
25.0	28-mar-1990	JS11	V		44.500	UGG
30.0	28-mar-1990	JS11	V		36.300	UGG
35.0	28-mar-1990	JS11	V		22.600	UGG
40.0	28-mar-1990	JS11	V		26.700	UGG
45.0	28-mar-1990	JS11	V		35.900	UGG
50.0	28-mar-1990	JS11	V		51.500	UGG
60.0	28-mar-1990	JS11	V		33.500	UGG
70.0	28-mar-1990	JS11	V		57.600	UGG
80.0	28-mar-1990	JS11	V		49.400	UGG
90.0	28-mar-1990	JS11	V		60.600	UGG
50.0	28-mar-1990	JS11	V		35.100	UGG
5.0	28-mar-1990	JS11	ZN		72.200	UGG
25.0	28-mar-1990	JS11	ZN		58.500	UGG
50.0	28-mar-1990	JS11	ZN		60.900	UGG
90.0	28-mar-1990	JS11	ZN		64.900	UGG
5.0	28-mar-1990	JY02	CRHEX		0.700	UGG
5.0	28-mar-1990	LM18	UNK512		0.220	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE DMO-10-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
90.0	29-mar-1990	JB01	HG		0.100	UGG
5.0	28-mar-1990	JD19	AS		9.300	UGG
50.0	28-mar-1990	JD19	AS		3.500	UGG
10.0	28-mar-1990	JD19	AS		8.900	UGG
15.0	28-mar-1990	JD19	AS		10.400	UGG
20.0	28-mar-1990	JD19	AS		6.500	UGG
25.0	28-mar-1990	JD19	AS		1.300	UGG
30.0	28-mar-1990	JD19	AS		1.400	UGG
40.0	28-mar-1990	JD19	AS		10.000	UGG
45.0	28-mar-1990	JD19	AS		2.900	UGG
50.0	28-mar-1990	JD19	AS		4.000	UGG
80.0	29-mar-1990	JD19	AS		4.200	UGG
60.0	29-mar-1990	JD19	AS		10.600	UGG
70.0	29-mar-1990	JD19	AS		2.800	UGG
80.0	29-mar-1990	JD19	AS		4.400	UGG
90.0	29-mar-1990	JD19	AS		11.000	UGG
5.0	28-mar-1990	JS11	BA		260.900	UGG
10.0	28-mar-1990	JS11	BA		148.300	UGG
15.0	28-mar-1990	JS11	BA		247.500	UGG
20.0	28-mar-1990	JS11	BA		73.800	UGG
30.0	28-mar-1990	JS11	BA		75.600	UGG
40.0	28-mar-1990	JS11	BA		140.400	UGG
45.0	28-mar-1990	JS11	BA		118.400	UGG
50.0	28-mar-1990	JS11	BA		206.400	UGG
50.0	28-mar-1990	JS11	BA		167.200	UGG
60.0	29-mar-1990	JS11	BA		488.600	UGG
70.0	29-mar-1990	JS11	BA		208.400	UGG
80.0	29-mar-1990	JS11	BA		95.500	UGG
90.0	29-mar-1990	JS11	BA		196.700	UGG
80.0	29-mar-1990	JS11	BA		153.300	UGG
5.0	28-mar-1990	JS11	MO		2.000	UGG
15.0	28-mar-1990	JS11	MO		5.300	UGG
40.0	28-mar-1990	JS11	MO		4.100	UGG
60.0	29-mar-1990	JS11	MO		3.500	UGG
5.0	28-mar-1990	JS11	PB		16.100	UGG
40.0	28-mar-1990	JS11	PB		9.600	UGG
60.0	29-mar-1990	JS11	PB		17.000	UGG
90.0	29-mar-1990	JS11	PB		18.100	UGG
5.0	28-mar-1990	JS11	V		49.900	UGG
10.0	28-mar-1990	JS11	V		34.700	UGG
15.0	28-mar-1990	JS11	V		66.300	UGG
20.0	28-mar-1990	JS11	V		24.100	UGG
30.0	28-mar-1990	JS11	V		32.500	UGG
40.0	28-mar-1990	JS11	V		49.400	UGG
45.0	28-mar-1990	JS11	V		37.000	UGG
50.0	28-mar-1990	JS11	V		55.500	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE DNO-10-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.0	28-mar-1990	JS11	V		51.100	UGG
60.0	29-mar-1990	JS11	V		107.400	UGG
70.0	29-mar-1990	JS11	V		68.700	UGG
80.0	29-mar-1990	JS11	V		47.000	UGG
90.0	29-mar-1990	JS11	V		70.400	UGG
80.0	29-mar-1990	JS11	V		55.800	UGG
5.0	28-mar-1990	JS11	ZN		141.700	UGG
15.0	28-mar-1990	JS11	ZN		73.900	UGG
50.0	28-mar-1990	JS11	ZN		59.100	UGG
60.0	29-mar-1990	JS11	ZN		108.200	UGG
70.0	29-mar-1990	JS11	ZN		67.400	UGG
90.0	29-mar-1990	JS11	ZN		63.600	UGG
80.0	29-mar-1990	JS11	ZN		58.500	UGG
5.0	28-mar-1990	JY02	CRHEX		1.200	UGG
10.0	28-mar-1990	LH10	HPCL		0.010	UGG
5.0	28-mar-1990	LM18	12EPCH		0.100	UGG
15.0	28-mar-1990	LM18	B2EHP		0.920	UGG
5.0	28-mar-1990	LM18	TCLEA		0.210	UGG
5.0	28-mar-1990	LM18	UNK536		0.100	UGG
5.0	28-mar-1990	LM18	UNK538		0.100	UGG
5.0	28-mar-1990	LM18	UNK556		0.100	UGG
5.0	28-mar-1990	LM18	UNK583		0.520	UGG
60.0	29-mar-1990	LM18	UNK589		0.900	UGG
70.0	29-mar-1990	LM18	UNK589		0.700	UGG
80.0	29-mar-1990	LM18	UNK589		0.210	UGG
90.0	29-mar-1990	LM18	UNK589		0.120	UGG
15.0	28-mar-1990	LM18	UNK614		0.100	UGG
10.0	28-mar-1990	LM18	UNK641		0.090	UGG
10.0	28-mar-1990	LM18	UNK645		0.310	UGG
15.0	28-mar-1990	LM18	UNK648		0.770	UGG
60.0	29-mar-1990	LM19	CH2CL2		0.210	UGG
70.0	29-mar-1990	LM19	CH2CL2		0.030	UGG
5.0	28-mar-1990	LM19	TRCLE		0.010	UGG
60.0	29-mar-1990	LM19	TRCLE		0.220	UGG
70.0	29-mar-1990	LM19	TRCLE		0.090	UGG
90.0	29-mar-1990	LM19	TRCLE		0.020	UGG
60.0	29-mar-1990	LM19	UNK129		0.030	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE OMO-11-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
45.0	30-mar-1990	JD19	AS		2.600	UGG
5.0	30-mar-1990	JD19	AS		11.000	UGG
10.0	30-mar-1990	JD19	AS		9.200	UGG
15.0	30-mar-1990	JD19	AS		5.200	UGG
20.0	30-mar-1990	JD19	AS		8.400	UGG
25.0	30-mar-1990	JD19	AS		8.100	UGG
30.0	30-mar-1990	JD19	AS		2.700	UGG
35.0	30-mar-1990	JD19	AS		9.300	UGG
40.0	30-mar-1990	JD19	AS		5.100	UGG
45.0	30-mar-1990	JD19	AS		3.200	UGG
50.0	30-mar-1990	JD19	AS		2.700	UGG
60.0	30-mar-1990	JD19	AS		6.100	UGG
70.0	30-mar-1990	JD19	AS		3.200	UGG
80.0	30-mar-1990	JD19	AS		4.300	UGG
90.0	30-mar-1990	JD19	AS		3.400	UGG
5.0	30-mar-1990	JS11	BA		257.300	UGG
10.0	30-mar-1990	JS11	BA		224.800	UGG
15.0	30-mar-1990	JS11	BA		302.200	UGG
20.0	30-mar-1990	JS11	BA		130.100	UGG
25.0	30-mar-1990	JS11	BA		220.200	UGG
30.0	30-mar-1990	JS11	BA		120.900	UGG
40.0	30-mar-1990	JS11	BA		87.000	UGG
45.0	30-mar-1990	JS11	BA		203.900	UGG
50.0	30-mar-1990	JS11	BA		64.400	UGG
60.0	30-mar-1990	JS11	BA		135.300	UGG
70.0	30-mar-1990	JS11	BA		232.000	UGG
80.0	30-mar-1990	JS11	BA		58.600	UGG
90.0	30-mar-1990	JS11	BA		85.800	UGG
45.0	30-mar-1990	JS11	BA		253.700	UGG
5.0	30-mar-1990	JS11	MO		1.900	UGG
15.0	30-mar-1990	JS11	MO		2.100	UGG
20.0	30-mar-1990	JS11	MO		3.700	UGG
25.0	30-mar-1990	JS11	MO		2.200	UGG
60.0	30-mar-1990	JS11	MO		2.500	UGG
70.0	30-mar-1990	JS11	MO		2.200	UGG
5.0	30-mar-1990	JS11	PB		14.400	UGG
10.0	30-mar-1990	JS11	PB		10.700	UGG
15.0	30-mar-1990	JS11	PB		9.700	UGG
20.0	30-mar-1990	JS11	PB		8.100	UGG
5.0	30-mar-1990	JS11	V		43.300	UGG
10.0	30-mar-1990	JS11	V		44.300	UGG
15.0	30-mar-1990	JS11	V		100.500	UGG
20.0	30-mar-1990	JS11	V		50.600	UGG
25.0	30-mar-1990	JS11	V		74.000	UGG
30.0	30-mar-1990	JS11	V		35.300	UGG
40.0	30-mar-1990	JS11	V		29.600	UGG
45.0	30-mar-1990	JS11	V		54.300	UGG

Site: BORE DMO-11-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.0	30-mar-1990	JS11	V		35.900	UGG
60.0	30-mar-1990	JS11	V		68.000	UGG
70.0	30-mar-1990	JS11	V		79.500	UGG
80.0	30-mar-1990	JS11	V		53.700	UGG
90.0	30-mar-1990	JS11	V		30.500	UGG
45.0	30-mar-1990	JS11	V		63.400	UGG
10.0	30-mar-1990	JS11	ZN		64.700	UGG
15.0	30-mar-1990	JS11	ZN		125.800	UGG
25.0	30-mar-1990	JS11	ZN		66.600	UGG
45.0	30-mar-1990	JS11	ZN		68.900	UGG
70.0	30-mar-1990	JS11	ZN		75.600	UGG
45.0	30-mar-1990	JS11	ZN		79.000	UGG
15.0	30-mar-1990	LH10	ALDRN		0.060	UGG
15.0	30-mar-1990	LH10	PPDDD		2.230	UGG
15.0	30-mar-1990	LH10	PPDDE		0.020	UGG
15.0	30-mar-1990	LH10	PPDDT		2.560	UGG
20.0	30-mar-1990	LH10	PPDDT		0.010	UGG
15.0	30-mar-1990	LM18	12DCLB		76.630	UGG
80.0	30-mar-1990	LM18	12EPCH		0.110	UGG
90.0	30-mar-1990	LM18	12EPCH		0.110	UGG
15.0	30-mar-1990	LM18	14DCLB		23.600	UGG
15.0	30-mar-1990	LM18	26DMLD		22.500	UGG
15.0	30-mar-1990	LM18	2THPD		44.990	UGG
20.0	30-mar-1990	LM18	2THPD		2.100	UGG
25.0	30-mar-1990	LM18	2THPD		0.350	UGG
15.0	30-mar-1990	LM18	C12		5.620	UGG
15.0	30-mar-1990	LM18	C13		112.490	UGG
20.0	30-mar-1990	LM18	C13		1.050	UGG
15.0	30-mar-1990	LM18	C14		56.240	UGG
20.0	30-mar-1990	LM18	C14		2.100	UGG
25.0	30-mar-1990	LM18	C14		0.120	UGG
15.0	30-mar-1990	LM18	C15		112.490	UGG
20.0	30-mar-1990	LM18	C15		2.100	UGG
25.0	30-mar-1990	LM18	C15		0.470	UGG
15.0	30-mar-1990	LM18	C16		56.240	UGG
20.0	30-mar-1990	LM18	C16		2.100	UGG
25.0	30-mar-1990	LM18	C16		0.700	UGG
15.0	30-mar-1990	LM18	C17		56.240	UGG
20.0	30-mar-1990	LM18	C17		3.150	UGG
25.0	30-mar-1990	LM18	C17		0.590	UGG
25.0	30-mar-1990	LM18	C18		0.230	UGG
15.0	30-mar-1990	LM18	C19		33.750	UGG
25.0	30-mar-1990	LM18	C19		0.350	UGG
15.0	30-mar-1990	LM18	C20		22.500	UGG
20.0	30-mar-1990	LM18	C20		1.050	UGG
25.0	30-mar-1990	LM18	C20		0.230	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE DMD-11-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.0	30-mar-1990	LM18	CHONE		0.530	UGG
90.0	30-mar-1990	LM18	MEC6H5		0.110	UGG
50.0	30-mar-1990	LM18	PHENOL		1.820	UGG
45.0	30-mar-1990	LM18	PHENOL		0.670	UGG
15.0	30-mar-1990	LM18	UNK539		22.500	UGG
20.0	30-mar-1990	LM18	UNK542		0.420	UGG
15.0	30-mar-1990	LM18	UNK545		39.370	UGG
15.0	30-mar-1990	LM18	UNK552		33.750	UGG
15.0	30-mar-1990	LM18	UNK558		16.870	UGG
15.0	30-mar-1990	LM18	UNK567		28.120	UGG
20.0	30-mar-1990	LM18	UNK567		0.320	UGG
15.0	30-mar-1990	LM18	UNK574		22.500	UGG
20.0	30-mar-1990	LM18	UNK578		0.110	UGG
15.0	30-mar-1990	LM18	UNK579		16.870	UGG
20.0	30-mar-1990	LM18	UNK579		0.320	UGG
15.0	30-mar-1990	LM18	UNK580		39.370	UGG
20.0	30-mar-1990	LM18	UNK580		0.210	UGG
20.0	30-mar-1990	LM18	UNK581		0.950	UGG
25.0	30-mar-1990	LM18	UNK581		0.120	UGG
20.0	30-mar-1990	LM18	UNK586		0.210	UGG
20.0	30-mar-1990	LM18	UNK587		0.320	UGG
5.0	30-mar-1990	LM18	UNK589		0.100	UGG
10.0	30-mar-1990	LM18	UNK589		0.090	UGG
35.0	30-mar-1990	LM18	UNK589		0.090	UGG
15.0	30-mar-1990	LM18	UNK592		28.120	UGG
25.0	30-mar-1990	LM18	UNK592		0.230	UGG
15.0	30-mar-1990	LM18	UNK601		28.120	UGG
20.0	30-mar-1990	LM18	UNK601		0.630	UGG
20.0	30-mar-1990	LM18	UNK606		2.100	UGG
20.0	30-mar-1990	LM18	UNK615		0.210	UGG
20.0	30-mar-1990	LM18	UNK616		0.840	UGG
25.0	30-mar-1990	LM18	UNK616		0.230	UGG
20.0	30-mar-1990	LM18	UNK623		0.740	UGG
25.0	30-mar-1990	LM18	UNK623		0.230	UGG
15.0	30-mar-1990	LM19	111TCE	GT	1.000	UGG
15.0	30-mar-1990	LM19	113MCH		3.940	UGG
15.0	30-mar-1990	LM19	11DCE		0.160	UGG
15.0	30-mar-1990	LM19	12DCLE		0.110	UGG
15.0	30-mar-1990	LM19	12DCLP		0.050	UGG
15.0	30-mar-1990	LM19	C6H6		1.100	UGG
25.0	30-mar-1990	LM19	CH2CL2		0.010	UGG
15.0	30-mar-1990	LM19	CH2CL2		0.570	UGG
15.0	30-mar-1990	LM19	CHCL3		0.050	UGG
15.0	30-mar-1990	LM19	CL2BZ		224.970	UGG
15.0	30-mar-1990	LM19	CLC6H5	GT	1.000	UGG
15.0	30-mar-1990	LM19	ETC6H5	GT	1.000	UGG
15.0	30-mar-1990	LM19	MEC6H5	GT	1.000	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE DMO-11-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
15.0	30-mar-1990	LM19	MECYPE		0.560	UGG
15.0	30-mar-1990	LM19	TCLEA	GT	1.000	UGG
15.0	30-mar-1990	LM19	TCLEE	GT	1.000	UGG
25.0	30-mar-1990	LM19	TRCLE		0.030	UGG
15.0	30-mar-1990	LM19	TRCLE	GT	1.000	UGG
5.0	30-mar-1990	LM19	UNK076		0.010	UGG
25.0	30-mar-1990	LM19	UNK092		0.010	UGG
30.0	30-mar-1990	LM19	UNK092		0.020	UGG
15.0	30-mar-1990	LM19	UNK094		0.390	UGG
15.0	30-mar-1990	LM19	UNK098		1.120	UGG
15.0	30-mar-1990	LM19	UNK103		0.560	UGG
15.0	30-mar-1990	LM19	UNK115		2.250	UGG
50.0	30-mar-1990	LM19	UNK128		0.010	UGG
60.0	30-mar-1990	LM19	UNK128		0.020	UGG
15.0	30-mar-1990	LM19	UNK128		0.560	UGG
15.0	30-mar-1990	LM19	UNK138		3.370	UGG
15.0	30-mar-1990	LM19	UNK143		0.560	UGG
15.0	30-mar-1990	LM19	XYLEN	GT	1.000	UGG

Site: BORE DMO-12-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	20-mar-1990	JD19	AS		22.700	UGG
10.0	20-mar-1990	JD19	AS		3.900	UGG
15.0	20-mar-1990	JD19	AS		6.300	UGG
20.0	20-mar-1990	JD19	AS		6.200	UGG
25.0	20-mar-1990	JD19	AS		1.600	UGG
30.0	20-mar-1990	JD19	AS		4.200	UGG
35.0	20-mar-1990	JD19	AS		1.800	UGG
40.0	20-mar-1990	JD19	AS		9.300	UGG
45.0	20-mar-1990	JD19	AS		3.900	UGG
50.0	20-mar-1990	JD19	AS		7.800	UGG
60.0	20-mar-1990	JD19	AS		4.000	UGG
70.0	20-mar-1990	JD19	AS		6.100	UGG
80.0	20-mar-1990	JD19	AS		4.500	UGG
90.0	20-mar-1990	JD19	AS		4.900	UGG
95.0	20-mar-1990	JD19	AS		3.700	UGG
20.0	20-mar-1990	JD19	AS		4.600	UGG
5.0	20-mar-1990	JS11	BA		332.200	UGG
10.0	20-mar-1990	JS11	BA		69.400	UGG
15.0	20-mar-1990	JS11	BA		121.600	UGG
20.0	20-mar-1990	JS11	BA		111.300	UGG
25.0	20-mar-1990	JS11	BA		84.100	UGG
40.0	20-mar-1990	JS11	BA		221.300	UGG

Site: BORE DHO-12-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
45.0	20-mar-1990	JS11	BA		159.800	UGG
50.0	20-mar-1990	JS11	BA		200.200	UGG
20.0	20-mar-1990	JS11	BA		53.500	UGG
60.0	20-mar-1990	JS11	BA		297.600	UGG
70.0	20-mar-1990	JS11	BA		141.800	UGG
80.0	20-mar-1990	JS11	BA		76.800	UGG
90.0	20-mar-1990	JS11	BA		153.700	UGG
95.0	20-mar-1990	JS11	BA		353.900	UGG
5.0	20-mar-1990	JS11	MO		2.300	UGG
20.0	20-mar-1990	JS11	MO		2.700	UGG
40.0	20-mar-1990	JS11	MO		2.700	UGG
50.0	20-mar-1990	JS11	MO		2.200	UGG
40.0	20-mar-1990	JS11	PB		22.300	UGG
5.0	20-mar-1990	JS11	V		39.500	UGG
10.0	20-mar-1990	JS11	V		23.200	UGG
15.0	20-mar-1990	JS11	V		34.000	UGG
20.0	20-mar-1990	JS11	V		35.400	UGG
25.0	20-mar-1990	JS11	V		28.100	UGG
40.0	20-mar-1990	JS11	V		63.000	UGG
45.0	20-mar-1990	JS11	V		40.800	UGG
50.0	20-mar-1990	JS11	V		55.700	UGG
20.0	20-mar-1990	JS11	V		22.500	UGG
60.0	20-mar-1990	JS11	V		82.000	UGG
70.0	20-mar-1990	JS11	V		50.900	UGG
80.0	20-mar-1990	JS11	V		47.400	UGG
90.0	20-mar-1990	JS11	V		56.500	UGG
95.0	20-mar-1990	JS11	V		82.700	UGG
40.0	20-mar-1990	JS11	ZN		69.800	UGG
50.0	20-mar-1990	JS11	ZN		67.600	UGG
60.0	20-mar-1990	JS11	ZN		85.800	UGG
90.0	20-mar-1990	JS11	ZN		64.000	UGG
95.0	20-mar-1990	JS11	ZN		93.600	UGG
60.0	20-mar-1990	LM18	12EPCH		0.240	UGG
70.0	20-mar-1990	LM18	12EPCH		0.230	UGG
80.0	20-mar-1990	LM18	12EPCH		0.210	UGG
90.0	20-mar-1990	LM18	12EPCH		0.110	UGG
95.0	20-mar-1990	LM18	12EPCH		0.250	UGG
15.0	20-mar-1990	LM18	UNK614		0.210	UGG
40.0	20-mar-1990	LM19	ACET		0.020	UGG
40.0	20-mar-1990	LM19	B2CLEE		0.030	UGG
45.0	20-mar-1990	LM19	B2CLEE		0.020	UGG
60.0	20-mar-1990	LM19	B2CLEE		0.120	UGG
5.0	20-mar-1990	LM19	MEC6H5		0.000	UGG
10.0	20-mar-1990	LM19	MEC6H5		0.000	UGG
15.0	20-mar-1990	LM19	MEC6H5		0.000	UGG
20.0	20-mar-1990	LM19	MEC6H5		0.000	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE DMO-12-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	20-mar-1990	LM19	UNK071		0.110	UGG
10.0	20-mar-1990	LM19	UNK071		0.110	UGG
15.0	20-mar-1990	LM19	UNK071		0.210	UGG
20.0	20-mar-1990	LM19	UNK071		0.100	UGG
5.0	20-mar-1990	LM19	UNK076		0.010	UGG
10.0	20-mar-1990	LM19	UNK076		0.010	UGG
15.0	20-mar-1990	LM19	UNK076		0.020	UGG
20.0	20-mar-1990	LM19	UNK076		0.010	UGG

Site: BORE DMO-13-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	20-mar-1990	JD19	AS		19.200	UGG
10.0	20-mar-1990	JD19	AS		2.400	UGG
15.0	20-mar-1990	JD19	AS		10.300	UGG
20.0	20-mar-1990	JD19	AS		3.600	UGG
25.0	20-mar-1990	JD19	AS		3.100	UGG
30.0	20-mar-1990	JD19	AS		3.400	UGG
35.0	20-mar-1990	JD19	AS		1.200	UGG
40.0	20-mar-1990	JD19	AS		8.000	UGG
45.0	20-mar-1990	JD19	AS		3.100	UGG
50.0	20-mar-1990	JD19	AS		3.500	UGG
60.0	20-mar-1990	JD19	AS		4.200	UGG
70.0	20-mar-1990	JD19	AS		8.300	UGG
80.0	20-mar-1990	JD19	AS		8.100	UGG
90.0	20-mar-1990	JD19	AS		8.300	UGG
95.0	20-mar-1990	JD19	AS		2.900	UGG
50.0	20-mar-1990	JD19	AS		3.200	UGG
5.0	20-mar-1990	JS11	BA		415.000	UGG
15.0	20-mar-1990	JS11	BA		383.600	UGG
20.0	20-mar-1990	JS11	BA		61.100	UGG
25.0	20-mar-1990	JS11	BA		123.200	UGG
40.0	20-mar-1990	JS11	BA		174.900	UGG
45.0	20-mar-1990	JS11	BA		144.900	UGG
50.0	20-mar-1990	JS11	BA		120.300	UGG
60.0	20-mar-1990	JS11	BA		308.400	UGG
70.0	20-mar-1990	JS11	BA		205.000	UGG
50.0	20-mar-1990	JS11	BA		122.800	UGG
80.0	20-mar-1990	JS11	BA		147.200	UGG
90.0	20-mar-1990	JS11	BA		239.700	UGG
95.0	20-mar-1990	JS11	BA		383.100	UGG
5.0	20-mar-1990	JS11	MO		3.500	UGG
15.0	20-mar-1990	JS11	MO		2.700	UGG
40.0	20-mar-1990	JS11	MO		2.900	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE DMO-13-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
70.0	20-mar-1990	JS11	NO		3.400	UGG
15.0	20-mar-1990	JS11	PB		18.200	UGG
95.0	20-mar-1990	JS11	PB		12.000	UGG
5.0	20-mar-1990	JS11	V		67.200	UGG
15.0	20-mar-1990	JS11	V		108.100	UGG
20.0	20-mar-1990	JS11	V		23.700	UGG
25.0	20-mar-1990	JS11	V		43.000	UGG
40.0	20-mar-1990	JS11	V		49.300	UGG
45.0	20-mar-1990	JS11	V		44.800	UGG
50.0	20-mar-1990	JS11	V		28.500	UGG
60.0	20-mar-1990	JS11	V		80.700	UGG
70.0	20-mar-1990	JS11	V		44.200	UGG
50.0	20-mar-1990	JS11	V		44.500	UGG
80.0	20-mar-1990	JS11	V		65.000	UGG
90.0	20-mar-1990	JS11	V		60.000	UGG
95.0	20-mar-1990	JS11	V		86.900	UGG
5.0	20-mar-1990	JS11	ZN		80.800	UGG
15.0	20-mar-1990	JS11	ZN		154.400	UGG
40.0	20-mar-1990	JS11	ZN		58.200	UGG
45.0	20-mar-1990	JS11	ZN		58.100	UGG
60.0	20-mar-1990	JS11	ZN		84.200	UGG
80.0	20-mar-1990	JS11	ZN		68.300	UGG
90.0	20-mar-1990	JS11	ZN		90.200	UGG
95.0	20-mar-1990	JS11	ZN		99.000	UGG
10.0	20-mar-1990	LH10	HPCL		0.010	UGG
70.0	20-mar-1990	LM18	12EPCH		0.220	UGG
80.0	20-mar-1990	LM18	12EPCH		0.230	UGG
95.0	20-mar-1990	LM18	12EPCH		0.240	UGG
70.0	20-mar-1990	LM19	B2CLEE		0.010	UGG
25.0	20-mar-1990	LM19	UNK055		0.010	UGG
50.0	20-mar-1990	LM19	UNK055		0.020	UGG
50.0	20-mar-1990	LM19	UNK055		0.010	UGG

Site: BORE DSB-01-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.0	03-mar-1990	JD19	AS		3.400	UGG
5.0	03-mar-1990	JD19	AS		6.600	UGG
13.0	03-mar-1990	JD19	AS		17.800	UGG
1.0	03-mar-1990	JS11	BA		347.500	UGG
5.0	03-mar-1990	JS11	BA		472.000	UGG

Site: BORE DSB-01-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
13.0	03-mar-1990	JS11	BA		373.400	UGG
13.0	03-mar-1990	JS11	CR		31.000	UGG
13.0	03-mar-1990	JS11	MO		4.000	UGG
1.0	03-mar-1990	JS11	PB		7.800	UGG
1.0	03-mar-1990	JS11	V		45.100	UGG
5.0	03-mar-1990	JS11	V		130.200	UGG
13.0	03-mar-1990	JS11	V		100.900	UGG
5.0	03-mar-1990	JS11	ZN		73.500	UGG
13.0	03-mar-1990	JS11	ZN		84.200	UGG

Site: BORE DSB-02-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
1.0	04-mar-1990	JD19	AS		2.100	UGG
5.0	04-mar-1990	JD19	AS		2.300	UGG
35.0	04-mar-1990	JD19	AS		3.200	UGG
40.0	04-mar-1990	JD19	AS		12.500	UGG
1.0	04-mar-1990	JS11	BA		436.700	UGG
5.0	04-mar-1990	JS11	BA		198.300	UGG
35.0	04-mar-1990	JS11	BA		72.900	UGG
40.0	04-mar-1990	JS11	BA		626.300	UGG
1.0	04-mar-1990	JS11	PB		8.500	UGG
1.0	04-mar-1990	JS11	V		54.500	UGG
5.0	04-mar-1990	JS11	V		42.400	UGG
35.0	04-mar-1990	JS11	V		44.900	UGG
40.0	04-mar-1990	JS11	V		115.800	UGG

Site: BORE DSB-04-MWA

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
1.0	05-mar-1990	JD19	AS		7.700	UGG
5.0	05-mar-1990	JD19	AS		2.600	UGG
20.0	05-mar-1990	JD19	AS		5.200	UGG
1.0	05-mar-1990	JS11	BA		315.700	UGG
5.0	05-mar-1990	JS11	BA		72.300	UGG
20.0	05-mar-1990	JS11	BA		146.000	UGG
1.0	05-mar-1990	JS11	PB		18.500	UGG
1.0	05-mar-1990	JS11	V		49.700	UGG
5.0	05-mar-1990	JS11	V		30.200	UGG
20.0	05-mar-1990	JS11	V		51.000	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE DSB-04-MWA (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
1.0	05-mar-1990	JS11	ZN		79.900	UGG

Site: BORE TNT-07-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
35.0	03-apr-1990	JD15	SE		0.400	UGG
5.0	03-apr-1990	JD19	AS		3.500	UGG
10.0	03-apr-1990	JD19	AS		2.900	UGG
15.0	03-apr-1990	JD19	AS		9.700	UGG
20.0	03-apr-1990	JD19	AS		4.700	UGG
25.0	03-apr-1990	JD19	AS		4.900	UGG
30.0	03-apr-1990	JD19	AS		5.400	UGG
35.0	03-apr-1990	JD19	AS		4.200	UGG
40.0	03-apr-1990	JD19	AS		6.400	UGG
45.0	03-apr-1990	JD19	AS		9.600	UGG
50.0	03-apr-1990	JD19	AS		6.000	UGG
55.0	03-apr-1990	JD19	AS		14.900	UGG
40.0	03-apr-1990	JD19	AS		6.200	UGG
35.0	03-apr-1990	LW12	246TNT		2.500	UGG
35.0	03-apr-1990	LW12	24DNT		0.900	UGG
35.0	03-apr-1990	LW12	TETRYL		0.800	UGG

Site: BORE TNT-08-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	03-apr-1990	JD19	AS		5.200	UGG
10.0	03-apr-1990	JD19	AS		3.700	UGG
15.0	03-apr-1990	JD19	AS		2.800	UGG
20.0	03-apr-1990	JD19	AS		7.800	UGG
25.0	03-apr-1990	JD19	AS		3.000	UGG
30.0	03-apr-1990	JD19	AS		2.800	UGG
35.0	03-apr-1990	JD19	AS		3.200	UGG
40.0	03-apr-1990	JD19	AS		4.200	UGG
45.0	03-apr-1990	JD19	AS		3.200	UGG
50.0	03-apr-1990	JD19	AS		4.600	UGG
55.0	03-apr-1990	JD19	AS		14.200	UGG
35.0	03-apr-1990	JD19	AS		3.300	UGG
5.0	03-apr-1990	JS11	PB		29.600	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE TNT-09-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	03-apr-1990	JD19	AS		5.800	UGG
10.0	03-apr-1990	JD19	AS		3.200	UGG
15.0	03-apr-1990	JD19	AS		6.500	UGG
20.0	03-apr-1990	JD19	AS		5.100	UGG
25.0	03-apr-1990	JD19	AS		3.500	UGG
30.0	03-apr-1990	JD19	AS		3.700	UGG
35.0	03-apr-1990	JD19	AS		5.100	UGG
40.0	03-apr-1990	JD19	AS		5.000	UGG
45.0	03-apr-1990	JD19	AS		3.200	UGG
50.0	03-apr-1990	JD19	AS		3.700	UGG
55.0	03-apr-1990	JD19	AS		10.700	UGG
35.0	03-apr-1990	JD19	AS		6.600	UGG
5.0	03-apr-1990	JS11	PB		13.100	UGG
35.0	03-apr-1990	JS11	ZN		64.800	UGG

Site: BORE TNT-10-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	02-apr-1990	JD19	AS		8.900	UGG
10.0	02-apr-1990	JD19	AS		4.100	UGG
15.0	02-apr-1990	JD19	AS		8.300	UGG
20.0	02-apr-1990	JD19	AS		9.200	UGG
25.0	02-apr-1990	JD19	AS		4.400	UGG
30.0	02-apr-1990	JD19	AS		4.400	UGG
35.0	02-apr-1990	JD19	AS		2.700	UGG
40.0	02-apr-1990	JD19	AS		6.500	UGG
45.0	02-apr-1990	JD19	AS		1.600	UGG
50.0	02-apr-1990	JD19	AS		11.000	UGG
35.0	02-apr-1990	JD19	AS		6.700	UGG
5.0	02-apr-1990	JS11	PB		8.300	UGG
15.0	02-apr-1990	JS11	ZN		57.700	UGG
30.0	02-apr-1990	JS11	ZN		69.000	UGG
35.0	02-apr-1990	JS11	ZN		62.400	UGG
45.0	02-apr-1990	JS11	ZN		72.400	UGG
35.0	02-apr-1990	JS11	ZN		86.300	UGG
35.0	02-apr-1990	LW19	MEC6H5		0.000	UGG
15.0	02-apr-1990	LW19	UNK071		0.020	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE TNT-11-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	02-apr-1990	JD19	AS		2.900	UGG
10.0	02-apr-1990	JD19	AS		3.800	UGG
15.0	02-apr-1990	JD19	AS		16.100	UGG
20.0	02-apr-1990	JD19	AS		5.600	UGG
25.0	02-apr-1990	JD19	AS		1.800	UGG
30.0	02-apr-1990	JD19	AS		2.100	UGG
35.0	02-apr-1990	JD19	AS		4.200	UGG
40.0	02-apr-1990	JD19	AS		3.600	UGG
45.0	02-apr-1990	JD19	AS		3.200	UGG
50.0	02-apr-1990	JD19	AS		8.300	UGG
35.0	02-apr-1990	JD19	AS		3.600	UGG
15.0	02-apr-1990	JS11	ZN		82.100	UGG
35.0	02-apr-1990	LM19	UNK112		0.010	UGG

Site: BORE TNT-12-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
40.0	04-apr-1990	JD19	AS		2.900	UGG
5.0	04-apr-1990	JD19	AS		5.800	UGG
10.0	04-apr-1990	JD19	AS		2.600	UGG
15.0	04-apr-1990	JD19	AS		9.100	UGG
20.0	04-apr-1990	JD19	AS		5.700	UGG
25.0	04-apr-1990	JD19	AS		9.700	UGG
30.0	04-apr-1990	JD19	AS		6.600	UGG
35.0	04-apr-1990	JD19	AS		10.000	UGG
40.0	04-apr-1990	JD19	AS		4.200	UGG
45.0	04-apr-1990	JD19	AS		3.400	UGG
50.0	04-apr-1990	JD19	AS		3.500	UGG
35.0	04-apr-1990	JS11	ZN		67.100	UGG
40.0	04-apr-1990	LM19	TRCLE		0.000	UGG
5.0	04-apr-1990	LW12	135TNB		18.200	UGG
10.0	04-apr-1990	LW12	135TNB		38.500	UGG
15.0	04-apr-1990	LW12	135TNB		48.500	UGG
20.0	04-apr-1990	LW12	135TNB		14.900	UGG
25.0	04-apr-1990	LW12	135TNB		11.700	UGG
30.0	04-apr-1990	LW12	135TNB		7.800	UGG
35.0	04-apr-1990	LW12	135TNB		8.000	UGG
40.0	04-apr-1990	LW12	135TNB		1.300	UGG
45.0	04-apr-1990	LW12	135TNB		1.300	UGG
50.0	04-apr-1990	LW12	135TNB		2.400	UGG

Site: BORE TNT-12-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
40.0	04-apr-1990	LW12	135TNB		0.800	UGG
5.0	04-apr-1990	LW12	246TNT		25.800	UGG
10.0	04-apr-1990	LW12	246TNT		4.000	UGG
15.0	04-apr-1990	LW12	246TNT		14.500	UGG
20.0	04-apr-1990	LW12	246TNT		9.500	UGG
25.0	04-apr-1990	LW12	246TNT		3.700	UGG
30.0	04-apr-1990	LW12	246TNT		4.600	UGG
35.0	04-apr-1990	LW12	246TNT		0.500	UGG
10.0	04-apr-1990	LW12	24DNT		1.000	UGG
15.0	04-apr-1990	LW12	24DNT		1.900	UGG
20.0	04-apr-1990	LW12	24DNT		1.000	UGG
25.0	04-apr-1990	LW12	24DNT		0.800	UGG
30.0	04-apr-1990	LW12	24DNT		0.700	UGG
5.0	04-apr-1990	LW12	HMX		5.000	UGG
10.0	04-apr-1990	LW12	HMX		14.900	UGG
15.0	04-apr-1990	LW12	HMX		3.900	UGG
20.0	04-apr-1990	LW12	HMX		1.400	UGG
25.0	04-apr-1990	LW12	HMX		3.100	UGG
30.0	04-apr-1990	LW12	HMX		2.300	UGG
35.0	04-apr-1990	LW12	HMX		2.300	UGG
5.0	04-apr-1990	LW12	RDX		59.400	UGG
10.0	04-apr-1990	LW12	RDX		16.200	UGG
15.0	04-apr-1990	LW12	RDX		4.700	UGG
20.0	04-apr-1990	LW12	RDX		2.700	UGG
25.0	04-apr-1990	LW12	RDX		9.600	UGG
30.0	04-apr-1990	LW12	RDX		4.300	UGG
35.0	04-apr-1990	LW12	RDX		12.000	UGG
40.0	04-apr-1990	LW12	RDX		2.000	UGG
45.0	04-apr-1990	LW12	RDX		1.300	UGG
50.0	04-apr-1990	LW12	RDX		1.800	UGG
40.0	04-apr-1990	LW12	RDX		1.300	UGG

Site: BORE TNT-13-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
40.0	05-apr-1990	JD19	AS		3.100	UGG
5.0	05-apr-1990	JD19	AS		2.700	UGG
10.0	05-apr-1990	JD19	AS		3.200	UGG
15.0	05-apr-1990	JD19	AS		3.600	UGG
20.0	05-apr-1990	JD19	AS		1.600	UGG
25.0	05-apr-1990	JD19	AS		6.700	UGG
30.0	05-apr-1990	JD19	AS		13.600	UGG
35.0	05-apr-1990	JD19	AS		4.400	UGG
40.0	05-apr-1990	JD19	AS		3.600	UGG
45.0	05-apr-1990	JD19	AS		2.600	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE TNT-13-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.0	05-apr-1990	JD19	AS		2.900	UGG
40.0	05-apr-1990	JS11	ZN		85.300	UGG
5.0	05-apr-1990	LM19	TRCLE		0.030	UGG
5.0	05-apr-1990	LW12	135TNB		29.300	UGG
10.0	05-apr-1990	LW12	135TNB		25.300	UGG
15.0	05-apr-1990	LW12	135TNB		30.400	UGG
20.0	05-apr-1990	LW12	135TNB		22.200	UGG
25.0	05-apr-1990	LW12	135TNB		34.800	UGG
30.0	05-apr-1990	LW12	135TNB		6.900	UGG
35.0	05-apr-1990	LW12	135TNB		3.800	UGG
40.0	05-apr-1990	LW12	135TNB		10.200	UGG
45.0	05-apr-1990	LW12	135TNB		3.300	UGG
50.0	05-apr-1990	LW12	135TNB		6.600	UGG
40.0	05-apr-1990	LW12	135TNB		11.200	UGG
10.0	05-apr-1990	LW12	246TNT		1.200	UGG
15.0	05-apr-1990	LW12	246TNT		2.300	UGG
20.0	05-apr-1990	LW12	246TNT		5.300	UGG
25.0	05-apr-1990	LW12	246TNT		11.400	UGG
30.0	05-apr-1990	LW12	246TNT		3.700	UGG
35.0	05-apr-1990	LW12	246TNT		1.100	UGG
40.0	05-apr-1990	LW12	246TNT		1.700	UGG
40.0	05-apr-1990	LW12	246TNT		1.100	UGG
15.0	05-apr-1990	LW12	24DNT		1.600	UGG
20.0	05-apr-1990	LW12	24DNT		0.900	UGG
25.0	05-apr-1990	LW12	24DNT		4.000	UGG
40.0	05-apr-1990	LW12	24DNT		0.500	UGG
40.0	05-apr-1990	LW12	24DNT		0.600	UGG
5.0	05-apr-1990	LW12	HMX		4.700	UGG
10.0	05-apr-1990	LW12	HMX		5.300	UGG
15.0	05-apr-1990	LW12	HMX		5.200	UGG
20.0	05-apr-1990	LW12	HMX		3.900	UGG
25.0	05-apr-1990	LW12	HMX		17.900	UGG
30.0	05-apr-1990	LW12	HMX		1.300	UGG
35.0	05-apr-1990	LW12	HMX		0.800	UGG
40.0	05-apr-1990	LW12	HMX		0.900	UGG
40.0	05-apr-1990	LW12	HMX		0.900	UGG
5.0	05-apr-1990	LW12	RDX		2.100	UGG
10.0	05-apr-1990	LW12	RDX		2.600	UGG
15.0	05-apr-1990	LW12	RDX		3.700	UGG
20.0	05-apr-1990	LW12	RDX		5.000	UGG
25.0	05-apr-1990	LW12	RDX		13.300	UGG
30.0	05-apr-1990	LW12	RDX		2.800	UGG
35.0	05-apr-1990	LW12	RDX		6.500	UGG
40.0	05-apr-1990	LW12	RDX		8.500	UGG
45.0	05-apr-1990	LW12	RDX		2.900	UGG

Site: BORE TNT-13-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
50.0	05-apr-1990	LW12	RDX		1.900	UGG
40.0	05-apr-1990	LW12	RDX		8.700	UGG

Site: BORE TNT-14-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	09-apr-1990	JD19	AS		5.100	UGG
10.0	09-apr-1990	JD19	AS		3.100	UGG
15.0	09-apr-1990	JD19	AS		6.900	UGG
20.0	09-apr-1990	JD19	AS		2.600	UGG
25.0	09-apr-1990	JD19	AS		3.900	UGG
30.0	09-apr-1990	JD19	AS		8.100	UGG
35.0	09-apr-1990	JD19	AS		6.400	UGG
40.0	09-apr-1990	JD19	AS		1.900	UGG
45.0	09-apr-1990	JD19	AS		3.400	UGG
50.0	09-apr-1990	JD19	AS		4.400	UGG
40.0	09-apr-1990	JD19	AS		3.300	UGG
40.0	09-apr-1990	JS11	NI		27.000	UGG
40.0	09-apr-1990	JS11	ZN		75.200	UGG
40.0	09-apr-1990	JS11	ZN		85.200	UGG
5.0	09-apr-1990	LW12	135TNB		22.200	UGG
10.0	09-apr-1990	LW12	135TNB		16.600	UGG
15.0	09-apr-1990	LW12	135TNB		3.800	UGG
20.0	09-apr-1990	LW12	135TNB		7.200	UGG
25.0	09-apr-1990	LW12	135TNB		5.900	UGG
30.0	09-apr-1990	LW12	135TNB		5.300	UGG
35.0	09-apr-1990	LW12	135TNB		9.300	UGG
45.0	09-apr-1990	LW12	135TNB		10.000	UGG
50.0	09-apr-1990	LW12	135TNB		10.400	UGG
40.0	09-apr-1990	LW12	135TNB		3.700	UGG
20.0	09-apr-1990	LW12	246TNT		3.400	UGG
25.0	09-apr-1990	LW12	246TNT		1.200	UGG
30.0	09-apr-1990	LW12	246TNT		1.200	UGG
50.0	09-apr-1990	LW12	246TNT		1.100	UGG
5.0	09-apr-1990	LW12	24DNT		1.200	UGG
20.0	09-apr-1990	LW12	24DNT		1.100	UGG
50.0	09-apr-1990	LW12	24DNT		0.600	UGG
5.0	09-apr-1990	LW12	HMX		5.200	UGG
10.0	09-apr-1990	LW12	HMX		5.300	UGG
20.0	09-apr-1990	LW12	HMX		1.900	UGG
25.0	09-apr-1990	LW12	HMX		1.000	UGG
35.0	09-apr-1990	LW12	HMX		0.700	UGG
10.0	09-apr-1990	LW12	RDX		0.800	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE TNT-14-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
15.0	09-apr-1990	LW12	RDX		1.100	UGG
20.0	09-apr-1990	LW12	RDX		2.500	UGG
25.0	09-apr-1990	LW12	RDX		3.800	UGG
30.0	09-apr-1990	LW12	RDX		1.400	UGG
35.0	09-apr-1990	LW12	RDX		6.600	UGG
40.0	09-apr-1990	LW12	RDX		1.400	UGG
45.0	09-apr-1990	LW12	RDX		3.600	UGG
50.0	09-apr-1990	LW12	RDX		5.700	UGG
40.0	09-apr-1990	LW12	RDX		3.400	UGG

Site: BORE TNT-15-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
5.0	05-apr-1990	JD19	AS		4.500	UGG
10.0	05-apr-1990	JD19	AS		3.100	UGG
15.0	05-apr-1990	JD19	AS		13.100	UGG
20.0	05-apr-1990	JD19	AS		1.200	UGG
25.0	05-apr-1990	JD19	AS		3.000	UGG
30.0	05-apr-1990	JD19	AS		9.600	UGG
35.0	05-apr-1990	JD19	AS		4.200	UGG
40.0	05-apr-1990	JD19	AS		5.400	UGG
45.0	05-apr-1990	JD19	AS		2.500	UGG
50.0	05-apr-1990	JD19	AS		3.100	UGG
40.0	05-apr-1990	JD19	AS		4.600	UGG
40.0	05-apr-1990	JS11	CR		25.200	UGG
25.0	05-apr-1990	JS11	ZN		64.400	UGG
40.0	05-apr-1990	JS11	ZN		86.300	UGG
40.0	05-apr-1990	JS11	ZN		99.200	UGG
5.0	05-apr-1990	LW12	135TNB		28.300	UGG
10.0	05-apr-1990	LW12	135TNB		20.600	UGG
15.0	05-apr-1990	LW12	135TNB		19.200	UGG
20.0	05-apr-1990	LW12	135TNB		8.000	UGG
25.0	05-apr-1990	LW12	135TNB		15.700	UGG
30.0	05-apr-1990	LW12	135TNB		6.200	UGG
35.0	05-apr-1990	LW12	135TNB		7.300	UGG
40.0	05-apr-1990	LW12	135TNB		14.700	UGG
45.0	05-apr-1990	LW12	135TNB		9.300	UGG
50.0	05-apr-1990	LW12	135TNB		1.400	UGG
40.0	05-apr-1990	LW12	135TNB		14.400	UGG
5.0	05-apr-1990	LW12	246TNT		1.000	UGG
10.0	05-apr-1990	LW12	246TNT		0.800	UGG
15.0	05-apr-1990	LW12	246TNT		7.500	UGG
20.0	05-apr-1990	LW12	246TNT		0.600	UGG

Site: BORE TNT-15-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
25.0	05-apr-1990	LW12	246TNT		4.600	UGG
30.0	05-apr-1990	LW12	246TNT		2.100	UGG
40.0	05-apr-1990	LW12	246TNT		0.600	UGG
45.0	05-apr-1990	LW12	246TNT		0.900	UGG
40.0	05-apr-1990	LW12	246TNT		0.700	UGG
5.0	05-apr-1990	LW12	24DNT		0.600	UGG
15.0	05-apr-1990	LW12	24DNT		1.400	UGG
25.0	05-apr-1990	LW12	24DNT		1.300	UGG
45.0	05-apr-1990	LW12	24DNT		0.500	UGG
5.0	05-apr-1990	LW12	HMX		4.700	UGG
10.0	05-apr-1990	LW12	HMX		3.300	UGG
15.0	05-apr-1990	LW12	HMX		4.000	UGG
20.0	05-apr-1990	LW12	HMX		0.800	UGG
25.0	05-apr-1990	LW12	HMX		5.600	UGG
30.0	05-apr-1990	LW12	HMX		0.900	UGG
40.0	05-apr-1990	LW12	HMX		0.900	UGG
45.0	05-apr-1990	LW12	HMX		0.700	UGG
40.0	05-apr-1990	LW12	HMX		0.900	UGG
5.0	05-apr-1990	LW12	RDX		5.800	UGG
10.0	05-apr-1990	LW12	RDX		1.400	UGG
15.0	05-apr-1990	LW12	RDX		6.500	UGG
20.0	05-apr-1990	LW12	RDX		3.100	UGG
25.0	05-apr-1990	LW12	RDX		15.800	UGG
30.0	05-apr-1990	LW12	RDX		2.900	UGG
35.0	05-apr-1990	LW12	RDX		3.200	UGG
40.0	05-apr-1990	LW12	RDX		5.100	UGG
45.0	05-apr-1990	LW12	RDX		6.000	UGG
50.0	05-apr-1990	LW12	RDX		3.500	UGG
40.0	05-apr-1990	LW12	RDX		6.600	UGG

Site: BORE TNT-16-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
25.0	10-apr-1990	JD19	AS		9.400	UGG
5.0	10-apr-1990	JD19	AS		5.700	UGG
10.0	10-apr-1990	JD19	AS		3.500	UGG
15.0	10-apr-1990	JD19	AS		15.100	UGG
20.0	10-apr-1990	JD19	AS		1.700	UGG
25.0	10-apr-1990	JD19	AS		8.000	UGG
30.0	10-apr-1990	JD19	AS		7.700	UGG
35.0	10-apr-1990	JD19	AS		6.300	UGG
40.0	10-apr-1990	JD19	AS		4.500	UGG
45.0	10-apr-1990	JD19	AS		2.400	UGG
50.0	10-apr-1990	JD19	AS		3.200	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE TNT-16-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
45.0	10-apr-1990	JS11	ZN		58.000	UGG
5.0	10-apr-1990	LW12	135TNB		19.300	UGG
10.0	10-apr-1990	LW12	135TNB		33.400	UGG
15.0	10-apr-1990	LW12	135TNB		41.600	UGG
20.0	10-apr-1990	LW12	135TNB		12.400	UGG
25.0	10-apr-1990	LW12	135TNB		7.300	UGG
30.0	10-apr-1990	LW12	135TNB		4.900	UGG
35.0	10-apr-1990	LW12	135TNB		10.100	UGG
40.0	10-apr-1990	LW12	135TNB		8.500	UGG
25.0	10-apr-1990	LW12	135TNB		7.100	UGG
5.0	10-apr-1990	LW12	246TNT		16.700	UGG
10.0	10-apr-1990	LW12	246TNT		2.100	UGG
20.0	10-apr-1990	LW12	246TNT		2.700	UGG
20.0	10-apr-1990	LW12	24DNT		1.600	UGG
20.0	10-apr-1990	LW12	RDX		0.900	UGG
25.0	10-apr-1990	LW12	RDX		0.700	UGG
30.0	10-apr-1990	LW12	RDX		0.700	UGG
35.0	10-apr-1990	LW12	RDX		0.900	UGG
40.0	10-apr-1990	LW12	RDX		1.700	UGG
45.0	10-apr-1990	LW12	RDX		2.100	UGG
50.0	10-apr-1990	LW12	RDX		1.700	UGG

Site: BORE TNT-17-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
25.0	09-apr-1990	JD19	AS		4.600	UGG
5.0	09-apr-1990	JD19	AS		3.600	UGG
10.0	09-apr-1990	JD19	AS		3.300	UGG
15.0	09-apr-1990	JD19	AS		5.200	UGG
20.0	09-apr-1990	JD19	AS		1.700	UGG
25.0	09-apr-1990	JD19	AS		4.400	UGG
30.0	09-apr-1990	JD19	AS		13.200	UGG
35.0	09-apr-1990	JD19	AS		4.500	UGG
40.0	09-apr-1990	JD19	AS		3.800	UGG
45.0	09-apr-1990	JD19	AS		6.100	UGG
50.0	09-apr-1990	JD19	AS		2.500	UGG
40.0	09-apr-1990	JS11	ZN		67.700	UGG
25.0	09-apr-1990	JS11	ZN		58.400	UGG
5.0	09-apr-1990	LW12	135TNB		16.900	UGG
10.0	09-apr-1990	LW12	135TNB		21.500	UGG
15.0	09-apr-1990	LW12	135TNB		14.800	UGG
20.0	09-apr-1990	LW12	135TNB		6.600	UGG

Site: BORE TNT-18-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
25.0	09-apr-1990	LW12	246TNT		0.700	UGG
25.0	09-apr-1990	LW12	24DNT		0.500	UGG
15.0	09-apr-1990	LW12	24DNT		1.400	UGG
25.0	09-apr-1990	LW12	24DNT		0.700	UGG
15.0	09-apr-1990	LW12	RDX		0.900	UGG
35.0	09-apr-1990	LW12	RDX		1.100	UGG
40.0	09-apr-1990	LW12	RDX		0.600	UGG
45.0	09-apr-1990	LW12	RDX		0.600	UGG

Site: BORE TNT-19-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
25.0	10-apr-1990	JD19	AS		6.200	UGG
5.0	10-apr-1990	JD19	AS		4.200	UGG
10.0	10-apr-1990	JD19	AS		3.600	UGG
15.0	10-apr-1990	JD19	AS		8.400	UGG
20.0	10-apr-1990	JD19	AS		2.800	UGG
25.0	10-apr-1990	JD19	AS		6.700	UGG
30.0	10-apr-1990	JD19	AS		28.900	UGG
35.0	10-apr-1990	JD19	AS		4.300	UGG
40.0	10-apr-1990	JD19	AS		1.200	UGG
45.0	10-apr-1990	JD19	AS		4.500	UGG
50.0	10-apr-1990	JD19	AS		2.600	UGG
50.0	10-apr-1990	JS11	ZN		68.000	UGG
25.0	10-apr-1990	LW12	135TNB		4.100	UGG
5.0	10-apr-1990	LW12	135TNB		16.400	UGG
10.0	10-apr-1990	LW12	135TNB		26.300	UGG
15.0	10-apr-1990	LW12	135TNB		9.800	UGG
20.0	10-apr-1990	LW12	135TNB		4.500	UGG
25.0	10-apr-1990	LW12	135TNB		5.200	UGG
30.0	10-apr-1990	LW12	135TNB		2.700	UGG
35.0	10-apr-1990	LW12	135TNB		10.400	UGG
40.0	10-apr-1990	LW12	135TNB		11.400	UGG
5.0	10-apr-1990	LW12	246TNT		7.400	UGG
15.0	10-apr-1990	LW12	24DNT		1.000	UGG
35.0	10-apr-1990	LW12	24DNT		0.500	UGG
40.0	10-apr-1990	LW12	24DNT		0.500	UGG
35.0	10-apr-1990	LW12	RDX		1.200	UGG
40.0	10-apr-1990	LW12	RDX		1.200	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: BORE TNT-17-SB (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
25.0	09-apr-1990	LW12	135TNB		11.200	UGG
30.0	09-apr-1990	LW12	135TNB		5.000	UGG
35.0	09-apr-1990	LW12	135TNB		12.200	UGG
40.0	09-apr-1990	LW12	135TNB		17.500	UGG
45.0	09-apr-1990	LW12	135TNB		2.200	UGG
50.0	09-apr-1990	LW12	135TNB		12.900	UGG
25.0	09-apr-1990	LW12	135TNB		8.600	UGG
5.0	09-apr-1990	LW12	246TNT		2.600	UGG
15.0	09-apr-1990	LW12	246TNT		1.900	UGG
40.0	09-apr-1990	LW12	RDX		1.500	UGG
50.0	09-apr-1990	LW12	RDX		1.900	UGG

Site: BORE TNT-18-SB

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
25.0	09-apr-1990	JD19	AS		10.800	UGG
5.0	09-apr-1990	JD19	AS		3.400	UGG
10.0	09-apr-1990	JD19	AS		4.800	UGG
15.0	09-apr-1990	JD19	AS		3.800	UGG
20.0	09-apr-1990	JD19	AS		2.500	UGG
25.0	09-apr-1990	JD19	AS		8.500	UGG
30.0	09-apr-1990	JD19	AS		10.800	UGG
35.0	09-apr-1990	JD19	AS		4.300	UGG
40.0	09-apr-1990	JD19	AS		2.100	UGG
45.0	09-apr-1990	JD19	AS		3.300	UGG
50.0	09-apr-1990	JD19	AS		4.100	UGG
45.0	09-apr-1990	JS11	ZN		62.600	UGG
50.0	09-apr-1990	JS11	ZN		85.700	UGG
25.0	09-apr-1990	LW12	135TNB		7.100	UGG
5.0	09-apr-1990	LW12	135TNB		22.100	UGG
10.0	09-apr-1990	LW12	135TNB		21.000	UGG
15.0	09-apr-1990	LW12	135TNB		27.400	UGG
20.0	09-apr-1990	LW12	135TNB		4.400	UGG
25.0	09-apr-1990	LW12	135TNB		7.500	UGG
30.0	09-apr-1990	LW12	135TNB		5.700	UGG
35.0	09-apr-1990	LW12	135TNB		10.900	UGG
40.0	09-apr-1990	LW12	135TNB		6.800	UGG
45.0	09-apr-1990	LW12	135TNB		1.900	UGG
50.0	09-apr-1990	LW12	135TNB		0.700	UGG
25.0	09-apr-1990	LW12	246TNT		0.500	UGG
5.0	09-apr-1990	LW12	246TNT		1.900	UGG
10.0	09-apr-1990	LW12	246TNT		1.000	UGG
15.0	09-apr-1990	LW12	246TNT		8.700	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: COMP TNT-01-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT		25.000	DEGC
0.5	04-apr-1990	JD19	AS		3.600	UGG
0.5	04-apr-1990	JS11	BA		131.800	UGG
0.5	04-apr-1990	JS11	PB		19.300	UGG
0.5	04-apr-1990	JS11	V		21.100	UGG
0.5	04-apr-1990	LW12	135TNB		111.400	UGG
0.5	04-apr-1990	LW12	246TNT		11928.900	UGG
0.5	04-apr-1990	LW12	HMX		7.000	UGG
0.5	04-apr-1990	LW12	RDX		313.400	UGG

Site: COMP TNT-02-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT		85.000	DEGC
0.5	04-apr-1990	JD19	AS		4.600	UGG
0.5	04-apr-1990	JS11	BA		181.400	UGG
0.5	04-apr-1990	JS11	PB		9.800	UGG
0.5	04-apr-1990	JS11	V		35.300	UGG
0.5	04-apr-1990	LW12	135TNB		121.700	UGG
0.5	04-apr-1990	LW12	246TNT		4577.300	UGG
0.5	04-apr-1990	LW12	24DNT		19.300	UGG
0.5	04-apr-1990	LW12	HMX		23.100	UGG
0.5	04-apr-1990	LW12	RDX		1298.200	UGG

Site: COMP TNT-03-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT		90.000	DEGC
0.5	04-apr-1990	JD19	AS		5.900	UGG
0.5	04-apr-1990	JS11	BA		337.500	UGG
0.5	04-apr-1990	JS11	PB		20.400	UGG
0.5	04-apr-1990	JS11	V		47.500	UGG
0.5	04-apr-1990	LW12	135TNB		47.900	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: COMP TNT-03-SS (continued)

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	LW12	246TNT		2198.000	UGG
0.5	04-apr-1990	LW12	24DNT		8.200	UGG
0.5	04-apr-1990	LW12	HMX		10.000	UGG
0.5	04-apr-1990	LW12	RDX		369.300	UGG

Site: COMP TNT-04-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT		90.000	DEGC
0.5	04-apr-1990	JD19	AS		5.000	UGG
0.5	04-apr-1990	JS11	BA		263.300	UGG
0.5	04-apr-1990	JS11	PB		24.300	UGG
0.5	04-apr-1990	JS11	V		37.300	UGG
0.5	04-apr-1990	LW12	135TNB		93.600	UGG
0.5	04-apr-1990	LW12	246TNT		8284.100	UGG
0.5	04-apr-1990	LW12	RDX		108.500	UGG

Site: COMP TNT-05-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT		50.000	DEGC
0.5	04-apr-1990	00	IGNIT	GT	100.000	DEGC
0.5	04-apr-1990	JD19	AS		6.000	UGG
0.5	04-apr-1990	JD19	AS		4.200	UGG
0.5	04-apr-1990	JS11	BA		208.000	UGG
0.5	04-apr-1990	JS11	BA		217.700	UGG
0.5	04-apr-1990	JS11	PB		9.100	UGG
0.5	04-apr-1990	JS11	V		25.100	UGG
0.5	04-apr-1990	JS11	V		33.500	UGG
0.5	04-apr-1990	LW12	135TNB		40.800	UGG
0.5	04-apr-1990	LW12	135TNB		42.700	UGG
0.5	04-apr-1990	LW12	246TNT		6507.200	UGG
0.5	04-apr-1990	LW12	246TNT		9871.100	UGG
0.5	04-apr-1990	LW12	RDX		2.700	UGG

Analytical Results for Chemical Soil
From: 01-jan-75 To: 13-mar-91
(Booleans LT and ND are excluded)

Site: COMP TNT-06-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT	GT	100.000	DEGC
0.5	04-apr-1990	JD19	AS		3.500	UGG
0.5	04-apr-1990	JS11	BA		213.500	UGG
0.5	04-apr-1990	JS11	V		34.400	UGG
0.5	04-apr-1990	LW12	135TNB		22.300	UGG
0.5	04-apr-1990	LW12	246TNT		5865.000	UGG

Site: COMP TNT-07-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT		72.000	DEGC
0.5	04-apr-1990	JD19	AS		3.200	UGG
0.5	04-apr-1990	JS11	BA		113.300	UGG
0.5	04-apr-1990	LW12	135TNB		11.100	UGG
0.5	04-apr-1990	LW12	246TNT		288.300	UGG

Site: COMP TNT-08-SS

SAMPLE DEPTH (ft)	SAMPLE DATE	TEST METHOD	COMPOUND	BOOL	CONCENTRATION	UNITS
0.5	04-apr-1990	00	IGNIT	GT	100.000	DEGC
0.5	04-apr-1990	JD19	AS		3.000	UGG
0.5	04-apr-1990	JS11	BA		106.900	UGG
0.5	04-apr-1990	JS11	V		20.800	UGG
0.5	04-apr-1990	LW12	135TNB		1.400	UGG
0.5	04-apr-1990	LW12	246TNT		7.800	UGG

Program ended normally.

Appendix Q1

Shower Inhalation Exposure Model

JMM James M. Montgomery
Consulting Engineers Inc.

SHOWER INHALATION EXPOSURE MODEL

Q.1.0.1. This model, used to represent the inhalation of VOCs while showering, was developed by Foster and Chrostowski (1987). The model was developed in response to experiments performed by Andelman (1985). There is extremely good agreement between the model and the experiments.

Q.1.0.2. The model assumes that there is a two-film boundary between the water and air across which VOCs can volatilize. The VOCs build up in the room for the duration of the shower; after the shower is turned off, the VOC concentration in the bathroom gradually declines. The complete inhalation exposure can be calculated by Equation A-1:

$$Dose = \frac{IR}{BW} \frac{1\ mg}{1{,}000 \mu g} \frac{1\ m^3}{1{,}000\ L} D_O \int C_a(t) dt$$

A-1

where:	Dose	=	Dose per shower (mg/kg/shower),
	IR	=	Air inhalation rate (l/min),
	BW	=	Body weight (kg),
	Dt	=	Total duration in the shower room (min), and
	Ca(t)	=	Concentration of the VOC in air as a function of time (μg/m3).

Q.1.0.3. The VOC concentration in air can be estimated by using a simple box model.

$$\frac{dC_a}{dt} = - R_a C_b + S$$

A-2

where:	Ra	=	Air exchange rate (min-1), and
	S	=	VOC emission rate per unit volume (μg/m3 - min).

This type of model assumes instantaneous mixing throughout the shower room. This may result in underestimating the VOC exposure by the individual, as VOC concentrations should be higher by the shower spray (where the individual stands) than in the rest of the room.

Q.1.0.4. The VOC emission rate has two values. One corresponds to when the shower is on. This value is calculated. The emission rate is zero when the shower is off. By solving Equation A-2 for Ca and substituting into Equation A-1, an expression is obtained for the total inhalation dose.

$$Dose: = \frac{IR\ S}{BW\ R_a}\ \frac{1\ mg}{1{,}000 \mu g}\ \frac{1 m^3}{1{,}000\ l}\ \frac{[(D_s + \exp\ (-R_a D_t)}{R_a} - \frac{\exp\ (R_a D_s - D_t)]}{R_a}$$

A-3

where: Ds = Shower duration (min).

Q.1.0.5. In order to solve Equation A-3, the VOC emission rate while the shower is operating must be calculated. The emission rate can be expressed by:

$$S = \frac{C_{wd} FR}{SV}$$

A-4

where: Cwd = Reduction in concentration of VOC in water droplet while falling (μg/l),

FR = Shower flow rate (l/min), and

SV = Shower room volume (m3).

While the flow rate and the room volume can be estimated, (the values of all parameters used are given in Tables A-1 to A-3) Cwd must be calculated.

Q.1.0.6. Cwd is calculated by assuming that the shower water immediately forms uniformly sized droplets and that VOCs will cross each droplet boundary into the air while the droplet falls straight to the ground. The latter assumption will result in some underestimation of emissions, since some water will stick to the walls, the individual, and the shower floor before being fully drained. The water will continue to emit VOCs during this time.

$$C_{wd} = C_{wo}\ 1 - \exp \frac{(\ -K_{AL}\ t_s)}{60\ d}$$

A-5

where:	C_{wo}	=	VOC concentration in water (μg/l),
	K_{AL}	=	Adjusted overall mass transfer coefficient (cm/hr),
	t_s	=	Shower droplet drop time (sec), and
	d	=	Shower droplet diameter (mm).

This equation is based on an overall mass balance approach, which is explained in Foster and Chrostowski (1986). The number 60 in the equation is a conversion factor which corrects for the different units in KAL, ts, and d.

Q.1.0.7. The VOC concentration in water is taken as that found in the groundwater, although this concentration may actually be reduced by filtering and volatilization before the water reaches the shower head. The adjusted overall mass transfer coefficient (KAL) is calculated from the overall mass transfer coefficient (KL). The word "adjusted" refers to the correction made to convert a value of KL determined at one temperature to a different temperature. The adjustment is made using Equation A-6:

$$KAL = KL \left(\frac{T_1\mu_s}{T_s\mu_1}\right)^{0.5}$$

A-6

where:	T_1	=	Calibration water temperature of KL (oK),
	T_s	=	Shower water temperature (oK),
	μ_1	=	Water viscosity at T1 (cp),
	μ_s	=	Water viscosity at Ts (cp), and
	KL	=	Overall mass transfer coefficient (cm/hr).

Q.1.0.8. KL is calculated by Equation A-7:

$$KL = \left(\frac{1}{K_l} + \frac{RT}{Hk_g}\right)^{-0.5}$$

A-7

where:	k_l	=	Liquid-film mass transfer coefficient (cm/hr),
	k_g	=	Gas-film mass transfer coefficient (cm/hr),
	R	=	Ideal gas constant (m3 - atm/mol-oK),

T = Temperature at which kl was determined (oK), and

H = Henry's Law Constant (m3 - atm/mol).

This equation was derived by Liss and Slater (1974). It assumes that at the gas-liquid interface, there is a gas film and a liquid film in which the concentration of the solute is different from the solute concentration in the bulk media. It also assumes that there is a steady state situation in which the solute flux from the liquid film to the gas film equals the solute flux from the gas film to the liquid film. The rate of diffusion through the films is determined by the concentration gradient between the film and the bulk media multiplied by the appropriate mass transfer coefficient. It would seem questionable whether this model should work in the first several minutes of operating the shower, as initially there are no VOCs in the gas phase to diffuse into the liquid phase. Interestingly enough, there is almost perfect agreement between model and experiment for the first 10 minutes of shower operation.

Q.1.0.9. Typical values of kl and kg have been measured for a lake-air interface (a water-air system which has been carefully studied). kl has a value of about 20 cm/hr for CO2, while kg has a value of 3,000 cm/hr for H2O. These values can be related to other compounds by the following relationships:

$$k_g\ (VOC) = k_g\ (H_2O)\ \frac{(18\ g/mol)}{MW_{voc}}\ 0.5$$

A-8

where: MW = Molecular weight (g/mol).

$$k_l\ (VOC) = k_l(CO_2)\ \frac{(44\ g/mol)}{MW_{voc}}\ 0.5$$

A-9

where: MW = Molecular weight (g/mol).

TABLE Q1-1

CONSTANT SHOWER EXPOSURE PARAMETERS

Variable		Value Used	Rationale
IR -	Air Inhalation Rate (l/min)	10	Representative rate for light adult activity (USEPA, 1989).
BW -	Body Weight (kg)	70	National average.
D_t -	Total Durationtin Shower Room (min)	20	Best professional judgement, based on a 15 minute shower.
D_s -	Shower Duration (min)	15	95th percentile of a range of 1 to 20 minutes, with an average value of 7 minutes (USEPA, 1989).
R_a -	Air Exchange Rate (min-1)	0.0083	Most conservative of 0.0083 to 0.025 min-1 range given by Foster and Chrostowski (1987).
FR -	Shower Flow Rate (l/min)	22.5	Best professional judgement assuming a 40 gallon hot water heater and that half of the water used during a shower is contributed by the hot water heater. These factors limit the flow rate for a 15 minute shower.
SV -	Shower Room Volume (m^3)	5.66	Best professional judgement. Based on a room measuring 5' x 5' x 8', which is conservatively small.
t_s -	Shower Droplet Drop Time (s)	2	Foster and Chrostowski (1987).
d -	Shower Droplet Diameter (mm)	2	Foster and Chrostowski (1987).
T -	Temperature at which Mass Transfer Coefficients were Determined (°K)	293	Liss and Slater (1974).
T_s -	Temperature of Shower (°K)	316	Best professional judgement; equal to 110°F.
Water Viscosity (cp)			
	μ_l(293°K)	1.002	CRC Handbook (1977-78)
	μ_s(316°K)	0.618	CRC Handbook (1977-78)
R - Ideal Gas Constant	(m^3-atm/mol-°K)	8.21×10^{-5}	CRC Handbook (1977-78)

TABLE Q1-2

VOC SHOWER EXPOSURE PARAMETERS

VOC	Molecular Weight (g/mol)	Adjusted Mass Transfer Coefficient(K_{AL}) (cm/hr)	Liquid-Film Mass Transfer Coefficient(k_l) (cm/hr)	Gas-Film Mass Transfer Coefficient(k_g) (cm/hr)	Henry's[1] Law Constant(H) (m^3atm/mol)
Carbon Tetrachloride	154	14	11	1030	0.063
Chloroform	119	16	12	1170	0.011
1,2-Dichloroethane	99	16	12	1280	0.0026
Trichloroethene	131.5	15	11	1110	0.021

(1) Calculated by methods of Howe et. al. (1987) for 110°F.

TABLE Q1-3

SHOWER INHALATION EXPOSURE DOSE

VOC	VOC Concentration in Groundwater (µg/L)	VOC Concentration Leaving Water Droplet (µg/L)	VOC Emission Rate ($\mu g/m^3$-min)	Adult Exposure Dose (mg/kg/shower)	Child (0-5) Exposure Dose (mg/kg/shower)	Child (6-17) Exposure Dose (mg/kg/shower)
Abandoned Landfill						
Trichloroethylene	41	16	64	1.6×1^{-3}	1.1×18^{-2}	4.6×10^{-3}
Carbon Tetrachloride	0.32	0.12	0.48	1.2×10^{-5}	8.0×10^{-5}	3.4×10^{-5}
Chemical Burial Site						
Trichloroethylene	6.70	1.7	10.6	2.7×10^{-4}	1.8×10^{-3}	7.5×10^{-4}
DRMO Trench						
Trichloroethylene	23	9.0	36	9.1×10^{-4}	5.9×10^{-3}	2.5×10^{-3}
TNT Leach Beds - Leach Beds Subsite						
Trichloroethylene	26	10	40	1.0×10^{-3}	6.7×10^{-3}	2.9×10^{-3}
TNT Leach Beds - Vehicle Maintenance Area Subsite						
Trichloroethylene	900	360	1400	3.6×10^{-2}	2.3×10^{-1}	1.0×10^{-1}
Carbon Tetrachloride	210	79	310	7.9×10^{-3}	5.2×10^{-2}	2.2×10^{-2}
Chloroform	820	330	1300	3.4×10^{-2}	2.2×10^{-1}	9.4×10^{-2}
1,2-Dichloroethane	120	50	200	5.0×10^{-3}	3.3×10^{-2}	1.4×10^{-2}
TNT Leach Beds - Site Average						
Trichloroethylene	150	60	240	6.0×10^{-3}	4.0×10^{-2}	1.7×10^{-2}
Carbon Tetrachloride	32	12	47	1.2×10^{-3}	7.8×10^{-3}	1.3×10^{-1}
Chloroform	120	49	190	4.9×10^{-3}	3.2×10^{-2}	8.1×10^{-2}
1,2-Dichloroethane	17	7.2	29	7.3×10^{-4}	4.7×10^{-3}	9.1×10^{-2}

Appendix Q2

Determination of Chemicals of Concern

JMM James M. Montgomery
Consulting Engineers Inc.

TABLE Q2-1

NATIVE AND SIAD SURFACE SOIL (≤5 FT.) METAL CONCENTRATIONS, RANGE AND TTLC VALUES FOR ABANDONED LANDFILL

Element	Typical Range U.S. Soils[a]	Typical Range U.S. Desert Soils[b]	SIAD Range	Maximum Level, µg/gm	TTLC[c] mg/kg	Is Upper Level > Federal/State Standard? Y/N
Aluminum	--	--	--	--	--	--
Arsenic	0.1-97	1.2-18	2.1-17.9	11.0	500	N
Beryllium	15	<1-7	--	--		--
Barium	10-5,000	--	72-428	--	10,000	--
Cadmium	0.41-0.57	--	--	6.18	100	N
Chromium	1-2,000	10-200	12.7-30.9	48.4	2,500	N
Copper	1-700	5-100	--	446	2,500	N
Lead	10-700	10-70	6-17.2	440	1,000	N
Mercury	0.1-4.6	0.02-0.32	--	--	20	--
Nickel	5-700	7-150	--		2,000	N
Selenium	0.1-4.3	<0.1-1.1	--	0.441	100	N
Vanadium	7-500	--	30.2-130	--	2,400	--
Zinc	5-2,900	25-150	30.2-79	1,090	5,000	N

[a] Shaklette & Boerngen, 1984
[b] Kabata-Pendias and Pendias, 1984
[c] California State Register 86, No. 8-23-86 Title 26

TABLE Q2-2

COMPARISON OF MAXIMUM CONCENTRATION OF INORGANIC AND ORGANIC CONSTITUENTS OF WELL WATERS WITH CONCENTRATIONS CORRESPONDING TO FEDERAL AND STATE MAXIMUM CONTAMINANT LEVELS (MCLs) AND STATE ACTION LEVELS (ALs) FOR DRI'KING AND WATER AT THE ALF SITE

		Regulatory Limits for Drinking Water				
		Federal	State		Maximum	Is concentration > Federal/State Standard ?
Constituent	Units	MCL	MCL	AL	Concentration µg/L	Y/N
Inorganics						
Arsenic	mg/L	0.05	0.05	--	7.46	N
Barium	mg/L	1.0	1.0	--	54.7	N
Copper	mg/L	1.0	1.0	--	8.71	N
Mercury	mg/L	0.002	0.002	--	0.5	N
Selenium	mg/L	0.01	0.01	--	18.6	Y
Zinc	mg/L	5.0	5.0	--	62.5	N
Volatile Organic Compounds						
Carbon tetrachloride	µg/L	5.0	0.5	--	--	Y
Carbon disulfide	µg/L	--	--	--	--	--
Chloroform	µg/L	--	--	--	1.1	--
1,2-dichloroethene	µg/L	7.0	6	--	0.62	N
Ethylbenzene	µg/L	--	680	--	--	N
1,1,2,2-tetrachloroethane	µg/L	--	1.0	--	9.0	Y
Toluene	µg/L	--	--	--	--	N
1,1,1-trichloroethane	µg/L	2.0	200	100	--	N
Trichloroethene	µg/L	5.0	5.0	--	70.5	Y
Trichlorofluoromethane	µg/L	--	--	--	--	N
Extractable Organic Compounds						
bis(2-ethylhexyl)phthalate	µg/L	--	--	--	6.09	--

TABLE Q2-3
SOIL CONTAMINANTS DETECTED AT THE 5-FOOT LEVEL
ABANDONED LANDFILL

	SITE NUMBER				
	ALF-01-SB	ALF-02-SB	ALF-03-SB	ALF-04-SB	CRL
COMPOUND	ug/g	ug/g	ug/g	ug/g	
MOISTURE CONTENT (%)	1.7	4.5	11.4	3.5	
INORGANICS					
ARSENIC	7.12	9.95	11.0	23.0	<0.25
CADMIUM	<3.05	<3.05	6.18	<3.05	<3.05
CHROMIUM	<12.7	24.4	48.4	<12.7	<12.7
COPPER	<58.6	<58.6	447	<58.6	<58.6
LEAD	<6.62	85.0	440	<6.62	<6.62
NICKEL	<12.6	<12.6	43.6	<12.6	<12.6
SELENIUM	<0.250	<0.250	0.441	<0.250	<0.250
ZINC	56.3	141	1090	<30.2	<30.2
VOLATILE ORGANIC COMPOUNDS					
ACETONE	<0.195	<0.02	<0.02	<0.02	<0.02
TOLUENE	<0.0008	<0.0008	<0.008	<0.0008	<0.0008
TRICHLOROETHENE	<0.019	<0.003	0.019	<0.003	<0.003
TRICHLOROFLUOROMETHANE	<0.015	<0.006	0.015	<0.006	<0.006
EXTRACTABLE ORGANIC COMPOUNDS					
TOTAL PHENOLS	0.195	0.276	0.254	<0.10	<0.10
HEPTACHLOR	<0.006	<0.006	<0.006	<0.006	<0.006
DIOXIN/FURAN(b)					
TCDFs	<0.0000039	<0.0000073	0.00032	<0.0000063	(a)
PeCDFs	<0.0000052	<0.0000056	0.000021	<0.000012	(a)
HxCDFs	<0.0000058	<0.000011	0.000082	<0.0000028	(a)
HpCDFs	<0.0000086	<0.000016	0.00013	<0.0000049	(a)
OCDF	<0.000028	<0.00020	<0.000091	<0.000043	(a)
TCDDs	<0.0000063	<0.0000083	0.000035	<0.0000059	(a)
HpCDDs	<0.000012	0.00038	0.00017	<0.0000081	(a)
OCDD	<0.000043	0.0013	0.00022	<0.0000093	(a)

(a) Detection limit varies depending on sample volume.
(b) TCDD (2,3,7,8-Tetrachlorodibenzo-p-dioxin)
HpCDD (2,3,4,7,8-Heptachlorodibenzo-p-dioxin)
OCDD (2,3,4,5,6,7,8,9-Octachlorodibenzo-p-dioxin)
TCDF (2,3,7,8-Tetrachlorodibenzofuran)
PeCDF (2,3,4,7,8-pentachlorodibenzofuran)
HxCDF (2,3,4,6,7,8-Hexachlorodibenzofuran)
HpCDF (2,3,4,6,7,8,9-Heptachlorodibenzofuran)

Only analytes detected in site samples are listed on the table. A less than sign ("<") followed by the detection limit indicates that the analyte was not detected in the sample.

TABLE Q2-4
CONTAMINANTS DETECTED IN GROUNDWATER
ABANDONED LANDFILL(a)

COMPOUND	SITE NUMBER ALF-01-MWA ug/L	ALF-02-MWA ug/L	ALF-03-MWA ug/L	CRL
FIELD PARAMETERS				
pH (Std. Units)	7.50	7.22	7.18	
SPECIFIC CONDUCTIVITY @25C (umHos/cm)	900	1100	1350	
WATER TEMPERATURE (deg. C)				
INORGANICS				
ARSENIC	3.73	7.46	4.80	<0.25
BARIUM	19.9	16.2	53.5	<5.0
COPPER	8.71	<8.09	<8.09	<8.09
MERCURY	0.5	<0.2	<0.2	<0.2
SELENIUM	18.6	6.79	16.6	<3.02
ZINC	62.5	38.1	47.2	<21.1
CALCIUM (ug/L-CA)	108000	131000	192000	<500
SODIUM (ug/L-NA)	50600	77300	49200	<500
RESIDUE,DISS	762	4060	1250	<500
CHLORIDE	105000	67400	<2.30	<2.30
SULFATE	303000	453000	<10000	<10000
VOLATILE ORGANIC COMPOUNDS				
CARBON TETRACHLORIDE(b)	<0.250	<.250	<0.250	<0.250
CARBON TETRACHLORIDE	<0.58	<0.58	<0.58	<0.58
CARBON DISULFIDE	<0.50	<0.50	<0.50	<0.50
CHLOROFORM	<0.50	<0.50	1.13	<0.50
1,2-DICHLOROETHENE	<0.50	<0.621	<0.50	<0.50
ETHYLBENZENE	<0.50	<0.50	<0.50	<0.50
1,1,2,2-TETRACHLOROETHANE	<0.51	<0.51	9.0	<0.51
TOLUENE	<0.50	<0.50	<0.50	<0.50
1,1,1-TRICHLOROETHANE	<0.50	<0.50	<0.50	<0.50
TRICHLOROETHENE	<0.50	70.5	70.5	<0.50
TRICHLOROFLUOROMETHANE	<1.3	<1.3	<1.3	<1.3
EXTRACTABLE ORGANIC COMPOUNDS				
BIS(2-ETHYLHEXYL) PHTHALATE	<4.8	<4.8	<4.8	<4.8

(a) Groundwater value is the highest reported value for either Round 1 or Round 2 of sampling

(b) GC limit of detection

TABLE Q2-5

NATIVE AND SIAD SURFACE SOIL (≤5 FT.) METAL CONCENTRATIONS, RANGE AND TTLC VALUES FOR CHEMICAL BURIAL SITE/CONSTRUCTION DEBRIS LANDFILL SITE

Element	Typical Range U.S. Soils[a]	Typical Range U.S. Desert Soils[b]	SIAD Range	Maximum Level, μg/gm	TTLC[c]	Is Upper Level > Federal/State Standard? Y/N
Aluminum	--	--	--	--	--	--
Arsenic	0.1-97	1.2-18	2.1-17.9	10.2	500	N
Barium	10-5,000		72-48	--	10,000	--
Beryllium	1-15	<1-7	--	--	--	--
Cadmium	0.41-0.57	--	--	--	100	--
Chromium	1-2,000	10-200	12.7-30.9	<12.7	2,500	N
Copper	1-700	5-100	--	--	2,500	--
Lead	10-700	10-70	6.6-17.2	<6.12	1,000	N
Mercury	0.1-4.6	0.02-0.32	--	--	20	--
Nickel	5-700	7-150	--	<12.6	2,000	N
Selenium	0.1-4.30	<0.1-1.1	--	--	100	--
Vanadium	7-500	--	30.2-130	--	2,400	--
Zinc	5-2,900	25-150	30.5-79	<30.2	5,000	N

[a] Shaklette & Boerngen, 1984
[b] Kabata-Pendias and Pendias, 1984
[c] California State Register 86, No. 8-23-86 Title 26

TABLE Q2-6

COMPARISON OF MAXIMUM CONCENTRATION OF INORGANIC AND ORGANIC CONSTITUENTS OF WELL WATERS WITH CONCENTRATIONS CORRESPONDING TO FEDERAL AND STATE MAXIMUM CONTAMINANT LEVELS (MCLs) AND STATE ACTION LEVELS (ALs) FOR DRINKING WATER AT THE CHEMICAL BURIAL SITE/CONSTRUCTION DEBRIS LANDFILL

Constituent	Units	Regulatory Limits for Drinking Water: Federal MCL	State MCL	State AL	Maximum Concentration µg/L	Is concentration > Federal/State Standard ? Y/N
Inorganics						
Arsenic	mg/L	0.05	0.05	--	9.38	N
Barium	mg/L	1.0	1.0	--	38.3	N
Copper	mg/L	1.0	1.0	--	8.71	N
Mercury	mg/L	0.002	0.002	--	0.488	N
Selenium	mg/L	0.01	0.01	--	10.6	Y
Zinc	mg/L	5.0	5.0	--	48.7	N
Volatile Organic Compounds						
trans-1,3-dichloropropene	µg/L	--	0.05	--	--	N
Trichloroethene	µg/L	5.0	5.0	--	6.76	Y

TABLE Q2-7
SOIL CONTAMINANTS DETECTED AT THE 5-FOOT LEVEL
FOR THE CHEMICAL BURIAL SITE/CHEMICAL DEBRIS LANDFILL

	SITE NUMBER					
	CCB-01-SB	CCB-02-SB	CCB-03-SB	CCB-04-SB	CCB-05-SB	CRL
COMPOUND	ug/g	ug/g	ug/g	ug/g	ug/g	
MOISTURE CONTENT (%)	3.4	2.8	2.4	2.5	2.1	
INORGANICS						
ARSENIC	3.49	2.55	2.8	13	6.39	<0.25
CHROMIUM	<12.7	<12.7	<12.7	<12.7	<12.7	<12.7
LEAD	<6.62	<6.62	<6.62	<6.62	<6.62	<6.62
NICKEL	<12.6	<12.6	<12.6	<12.6	<12.6	<12.6
ZINC	<30.2	<30.2	<30.2	<30.2	<30.2	<30.2
VOLATILE ORGANIC COMPOUNDS						
TRICHLOROFLUOROMETHANE	0.009	0.008	0.008	<0.006	<0.006	<0.006
EXTRACTABLE ORGANIC COMPOUNDS						
TOTAL PHENOLS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
BIS(2-ETHYLHEXYL)PHTHALATE	<0.62	<0.62	<0.62	<0.62	<0.62	<0.62
CHLORDANE	1.04	0.576	<0.018	<0.018	<0.018	<0.018
HEPTACHLOR	0.007	0.007	<0.006	<0.006	<0.006	<0.006
HEPTACHLOR EPOXIDE	0.006	<0.006	<0.006	<0.006	<0.006	<0.006
DIOXIN						
OCDD(b)	<0.0000061	0.000062	0.000064	<0.000058	0.001	(a)

(a) Detection limit varies depending on sample volume.
(b) 2,3,4,5,6,7,8,9 - Octachlorodibenzo-p-dioxin

Only analytes detected in site samples are listed on the table. A less than sign ("<") followed by the detection limit indicates that the analyte was not detected in the sample.

TABLE Q2.8
GROUNDWATER SAMPLE RESULTS
CHEMICAL BURIAL SITE/CONSTRUCTION DEBRIS LANDFILL(a)

	SITE NUMBER		
	CCB-01-MWA	CCB-02-MWA	CRL
COMPOUND	ug/L	ug/L	
FIELD PARAMETERS			
pH (Std. Units)	7.67	7.49	
SPECIFIC CONDUCTIVITY @25C (umHos/cm)	590	890	
WATER TEMPERATURE (deg C)			
INORGANICS			
ARSENIC	9.38	7.25	<0.25
BARIUM	38.3	24.7	<5.0
COPPER	8.71	<8.09	<8.09
MERCURY	<0.2	0.488	<0.2
SELENIUM	3.41	10.6	<3.02
ZINC	<21.1	48.7	<21.1
CALCIUM (ug/L-CA)	72,000	110,000	<500
SODIUM (ug/L-NA)	41,400	51,600	<500
RESIDUE, DISSOLVED	516	740	<500
CHLORIDE	33,000	100,000	<2.30
SULFATE	116,000	260,000	<10,000
VOLATILE ORGANIC COMPOUNDS			
TRANS-1,3-DICHLOROPROPENE (a)	<0.250	<0.250	<0.250
TRICHLOROETHENE	<0.50	6.76	<0.50

(a) Groundwater value is the highest reported value for either Round 1 or Round 2 of sampling

TABLE Q2-9

NATIVE AND SIAD SURFACE SOIL ($\leq$5 FT.) METAL CONCENTRATIONS, RANGE AND TTLC VALUES FOR DRMO TRENCH AREA

Element	Typical Range U.S. Soils[a]	Typical Range U.S. Desert Soils[b]	SIAD Range	Maximum Level, μg/gm	TTLC[c] mg/kg	Is Upper Level > Federal/State Standard? Y/N
Arsenic	0.1-97	1.2-18	2.1-17.9	19.0	500	N
Barium	10-5,000	--	72-428	410	10,000	N
Chromium	1-2,000	10-200	12.7-30.9	1.12	2,500	N
Cobalt	--	--	--	< 15	8,000	N
Lead	10-700	10-70	6-17.2	16.1	1,000	N
Mercury	0.1-4.6	0.02-0.32	--	<0.05	20	N
Molybdenum	--	--	--	2.09	3,500	N
Vanadium	7-500	--	30.2-130	99.3	2,400	N
Zinc	20-108	25-150	30.2-79	142	5,000	N

[a] Shaklette & Boerngen, 1984
[b] Kabata-Pendias and Pendias, 1984
[c] California State Register 86, No. 8-23-86 Title 26

TABLE Q2-10

COMPARISON OF MAXIMUM CONCENTRATIONS OF INORGANIC AND ORGANIC CONSTITUENTS OF WELL WATER WITH CONCENTRATION CORRESPONDING TO FEDERAL AND STATE MAXIMUM CONTAMINANT LEVELS (MCLs) AND STATE ACTION LEVELS (ALs) FOR DRINKING WATER AT THE DRMO TRENCH AREA

Constituent	Units	Regulatory Limits for Drinking Water			Maximum Concentration μg/L	Is concentration > Federal/State Standard ? Y/N
		Federal	State			
		MCL	MCL	AL		
Inorganics						
Arsenic	mg/L	0.05	0.05	--	7.04	N
Barium	mg/L	1.0	1.0	--	35.0	N
Copper	mg/L	1.0	1.0	--	11.5	N
Selenium	mg/L	0.01	0.01	--	11.8	Y
Zinc	mg/L	5.0	5.0	--	72.1	N
Volatile Organic Compounds						
Chloroform	μg/L	100	--	--	<0.5	N
Trichloroethene	μg/L	5.0	5.0	--	25.7	Y
Extractable Organic Compounds						
bis(2-ethylhexyl)phthalate	μg/L	--	--	--	<4.8	--

TABLE Q2-11
SOIL COMTAMINANTS DETECTED AT THE 5-FOOT LEVEL
FOR THE DRMO TRENCH AREA

	SITE NUMBER							
	DMO-07-SB	DMO-08-SB	DMO-09-SB	DMO-10-SB	DMO-11-SB(a)	DMO-12-SB	DMO-13-SB	CRL
COMPOUND	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	
MOISTURE CONTENT (%)	6.9	7.5	7.2	3.1	11.1	8.1	7.3	
INORGANICS								
ARSENIC	19	11.4	14.0	9.27	5.09	23	19	<0.25
BARIUM	415	245	277	261	299.0	330	410	<29.6
COBALT	<15.0	<15.0	<15.0	<15.0	<15.0	<15.0	<15.0	<15.0
LEAD	<6.62	7.19	<6.62	15.4	9.6	<6.62	<6.62	<6.62
MERCURY	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
MOLYBDENUM	<1.15	<1.15	<1.15	2.03	2.09	2.26	3.47	<1.15
VANADIUM	61.5	55.0	53.5	49.9	99.3	39.2	66.9	<13.0
ZINC	77.2	67.1	72.1	142	124	<30.2	80.3	<30.2
VOLATILE ORGANIC COMPOUNDS								
ACETONE	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
BENZENE	<0.002	<0.002	<0.002	<0.002	1.09	<0.002	<0.002	<0.002
CHLOROBENZENE	<0.0009	<0.0009	<0.0009	<0.0009	>1.00 *	<0.0009	<0.0009	<0.0009
CHLOROFORM	<0.0009	<0.0009	<0.0009	<0.0009	0.054	<0.0009	<0.0009	<0.0009
1,2-DICHLOROETHANE	<0.002	<0.002	<0.002	<0.002	0.109	<0.002	<0.002	<0.002
1,1-DICHLOROETHENE	<0.004	<0.004	<0.004	<0.004	0.156	<0.004	<0.004	<0.004
1,2-DICHLOROPROPANE	<0.003	<0.003	<0.003	<0.003	0.051	<0.003	<0.003	<0.003
ETHYLBENZENE	<0.002	<0.002	<0.002	<0.002	>1.00*	<0.002	<0.002	<0.002
METHYLENE CHLORIDE	<0.012	<0.012	<0.012	<0.012	0.562	<0.012	<0.012	<0.012
1,1,2,2-TETRACHLOROETHANE	<0.002	<0.002	<0.002	<0.002	>1.00*	<0.002	<0.002	<0.002
TETRACHLOROETHENE	<0.0008	<0.0008	<0.0008	<0.0008	>1.00*	<0.0008	<0.0008	<0.0008
TOLUENE	<0.0008	<0.0008	<0.0008	<0.0008	>1.00*	0.001	<0.0008	<0.0008
1,1,1-TRICHLOROETHANE	<0.004	<0.004	<0.004	<0.004	>1.00*	<0.004	<0.004	<0.004
TRICHLOROETHENE	<0.003	0.02	<0.003	0.006	>1.00*	<0.003	<0.003	<0.003
XYLENES	<0.002	<0.002	<0.002	<0.002	>1.0*	<0.002	<0.002	<0.002
DICHLOROBENZENE,TOTAL	<0.10	<0.10	<0.10	<0.10	220	<0.10	<0.10	<0.10
EXTRACTABLE ORGANIC COMPOUNDS								
BIS(2-E-H)PHTHALATE	<0.62	<0.62	<0.62	<0.62	<31	<0.62	<0.62	<0.62
1,2-DICHLOROBENZENE	<0.11	<0.11	<0.11	<0.11	76.6	<0.11	<0.11	<0.11
1,4-DICHLOROBENZENE	<0.10	<0.10	<0.10	<0.10	23.6	<0.10	<0.10	<0.10
PHENOL	<0.11	<0.11	<0.11	<0.11	<5.5	<0.11	<0.11	<0.11
ALDRIN	<0.007	<0.007	<0.007	<0.007	0.058	<0.007	<0.007	<0.007
DDD,PP'	<0.008	<0.008	<0.008	<0.008	2.56	<0.008	<0.008	<0.008
DDE,PP'	<0.008	<0.008	<0.008	<0.008	0.024	<0.008	<0.008	<0.008
DDT,PP'	<0.007	<0.007	<0.007	<0.007	2.53	<0.007	<0.007	<0.007
HEPTACHLOR	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006

* - Concentration is greater than the Upper Certified Limit.

(a) Sample best approximates the 5-foot level at the bottom of the DRMO trench. See text pg. 7-8 for details.

TABLE Q2-12
GROUNDWATER SAMPLE RESULTS
DRMO TRENCH AREA(a)

COMPOUND	SITE NUMBER DMO-03-MWA ug/L	DMO-04-MWA ug/L	DMO-05-MWA ug/L	CRL
FIELD PARAMETERS				
pH (Std. Units)	7.25	7.14	7.63	
SPECIFIC CONDUCTIVITY @25C (umhos/cm)	1050	800	950	
WATER TEMPERATURE (deg. C)	16		16	
INORGANICS				
ARSENIC	2.88	7.04	4.8	<0.25
BARIUM	36.4	118.7	28.9	<5.0
COPPER	<8.09	<8.09	11.5	<8.09
SELENIUM	13.2	6.2	11.8	<3.02
ZINC	25.3	34.7	72.1	<21.1
CALCIUM (ug/L-CA)	120,000	91,000	97,000	<500
SODIUM (ug/L-NA)	78,000	67,000	75,000	<500
RESIDUE,DISS	902	710	826	<500
CHLORIDE	66,100	60,000	63,100	<2.30
SULFATE	444,000	224,000	323,000	<10,000
VOLATILE ORGANIC COMPOUNDS				
CHLOROFORM	<0.50	<0.50	<0.50	<0.50
TRICHLOROETHENE	10.2	4.18	25.7	<0.50
EXTRACTABLE ORGANIC COMPOUNDS				
BIS(2-ETHYLHEXYL) PHTHALATE	<4.8	<4.8	<4.8	<4.8

(a) Groundwater value is the highest reported value for either Round 1 or Round 2 of sampling.

TABLE Q2-13

NATIVE AND SIAD SURFACE SOIL ($\leq$5 FT.) METAL CONCENTRATIONS, RANGE AND TTLC VALUES FOR TNT LEACHING BEDS AREA

Element	Typical Range U.S. Soils[a]	Typical Range U.S. Desert Soils[b]	SIAD Range	Maximum Level, μg/gs	TTLC[c]	Is Upper Level > Federal/State Standard? Y/N
Aluminum	--	--	--	--	--	--
Arsenic	0.1-97	1.2-18	2.1-17.9	8.86	500	N
Barium	10-5,000	--	72-428	336	10,000	N
Beryllium	1-15	<1-7	--	--		--
Cadmium	0.41	0.57	--	--	100	--
Chromium	1-2,000	10-200	12.7-30.9	--	2,500	--
Copper	1-700	5-100	--	--	2,500	--
Lead	10-700	10-70	6-17.2	26.4	1,000	N
Mercury	0.1-4.6	0.02-0.32	--	--	20	--
Nickel	5-700	7-150	--	--	2,000	--
Selenium	<0.01-2.0	<0.1-1.1	--	--	100	--
Vanadium	7-500	--	--	--	2,400	--
Zinc	20-108	25-150	--	64.7	5,000	N

[a] Shaklette & Boerngen, 1984
[b] Kabata-Pendias and Pendias, 1984
[c] California State Register 86, No. 8-23-86 Title 26

TABLE Q2-14

COMPARISON OF MAXIMUM CONCENTRATION OF INORGANIC AND ORGANIC CONSTITUENTS OF WELL WATER WITH CONCENTRATION CORRESPONDING TO FEDERAL AND STATE MAXIMUM CONTAMINANT LEVELS (MCLs) AND STATE ACTION LEVELS (ALs) FOR DRINKING WATER AT TNT LEACHING BEDS AREA, A ZONE WELLS

Constituent	Units	Regulatory Limits for Drinking Water: Federal MCL	State MCL	State AL	Maximum Concentration µg/L	Is concentration > Federal/State Standard ? Y/N
Inorganics						
Arsenic	mg/L	0.05	0.05	--	31.4	N
Barium	mg/L	1.0	1.0	--	52.1	N
Copper	mg/L	1.0	1.0	--	<8.09	N
Mercury	mg/L	0.002	0.002	--	0.4	N
Selenium	mg/L	0.01	0.01	--	52.2	Y
Zinc	mg/L	5.0	5.0	--	68.0	N
Volatile Organic Compounds						
trans-1,3-dichloropropene	µg/L	--	0.5	--	--	--
Carbon tetrachloride	µg/L	5.0	0.5	--	190	Y
Chloroform	µg/L	--	--	--	923	--
1,2-dichloroethane	µg/L	5.0	0.5	--	101	Y
Toluene	µg/L	--	--	100	6.73	N
Methylene chloride	µg/L	--	--	40	<23	--
Trichloroethene	µg/L	5.0	5.0	--	952	Y
Extractable Organic Compounds						
bis(2-ethylhexyl)phthalate	µg/L	--	--	--	7.8	--
2,4-dinitrophenol	µg/L	--	--	--	17.5	--
2,4-dinitrotoluene	µg/L	--	--	--	90	--

TABLE Q2-14 (Continued)

COMPARISON OF MAXIMUM CONCENTRATION OF INORGANIC AND ORGANIC CONSTITUENTS OF WELL WATER WITH CONCENTRATION CORRESPONDING TO FEDERAL AND STATE MAXIMUM CONTAMINANT LEVELS (MCLs) AND STATE ACTION LEVELS (ALs) FOR DRINKING WATER AT TNT LEACHING BEDS AREA, A ZONE WELLS

Constituent	Units	Regulatory Limits for Drinking Water: Federal MCL	State MCL	State AL	Maximum Concentration $\mu g/L$	Is concentration > Federal/State Standard ? Y/N
Explosives						
2,4-dinitrotoluene	mg/L	--	--	--	90	--
HMX	mg/L	--	--	--	7.69	--
RDX	mg/L	--	--	--	250	--
Tetryl	mg/L	--	--	--	9.92	--
1,3,5-trinitrobenzene	mg/L	--	--	--	1,100	--
2,4,6-trinitrotoluene	mg/L	--	--	--	8.14	--

TABLE Q2-15

COMPARISON OF MAXIMUM CONCENTRATION OF INORGANIC AND ORGANIC CONSTITUENTS OF WELL WATER WITH CONCENTRATION CORRESPONDING TO FEDERAL AND STATE MAXIMUM CONTAMINANT LEVELS (MCLs) AND STATE ACTION LEVELS (ALs) FOR DRINKING WATER AT TNT LEACHING BEDS AREA, B ZONE WELLS

Constituent	Units	Regulatory Limits for Drinking Water: Federal MCL	State MCL	State AL	Maximum Concentration μg/L	Is concentration > Federal/State Standard ? Y/N
Inorganics						
Arsenic	mg/L	0.05	0.05	--	14.0	N
Barium	mg/L	1.0	1.0	--	23.9	N
Copper	mg/L	1.0	1.0	--	9.56	N
Mercury	mg/L	0.002	0.002	--	0.2	N
Selenium	mg/L	0.01	0.01	--	<3.0	N
Zinc	mg/L	5.0	5.0	--	81.7	N
Volatile Organic Compounds						
trans-1,3-dichloropropene	μg/L				--	--
Carbon tetrachloride	μg/L	5.0	0.5	--	0.899/<0.58	Y/N
Chloroform	μg/L	--	--	--	0.697	--
1,2-dichloroethane	μg/L	5.0	0.5		<0.50	--
Toluene	μg/L	--	--	100	<0.50	N
Methylene chloride	μg/L	--	--	40	<2.3	N
Trichloroethene	μg/L	5.0	5.0	--	0.838	N
Extractable Organic Compounds						
bis(2-ethylhexyl)phthalate	μg/L	--	--	--	4.8	--
2,4-dinitrophenol	μg/L	--	--	--	<21	--
2,4-dinitrotoluene	μg/L	--	--	--	<4.5	--

TABLE Q2-15 (Continued)

COMPARISON OF MAXIMUM CONCENTRATION OF INORGANIC AND ORGANIC CONSTITUENTS OF WELL WATER WITH CONCENTRATION CORRESPONDING TO FEDERAL AND STATE MAXIMUM CONTAMINANT LEVELS (MCLs) AND STATE ACTION LEVELS (ALs) FOR DRINKING WATER AT TNT LEACHING BEDS AREA, B ZONE WELLS

Constituent	Units	Regulatory Limits for Drinking Water: Federal MCL	State MCL	State AL	Maximum Concentration µg/L	Is concentration > Federal/State Standard ? Y/N
Explosives						
2,4-dinitrotoluene	µg/L	--	--	--	<0.612	--
HMX	µg/L	--	--	--	<1.65	--
RDX	µg/L	--	--	--	<2.11	--
Tertryl	µg/L	--	--	--	<0.6	--
1,3,5-trinitrobenzene	µg/L	--	--	--	<0.626	--
2,4,6-trinitrotoluene	µg/L	--	--	--	<0.588	--

TABLE Q2-16

COMPARISON OF MAXIMUM CONCENTRATION OF INORGANIC AND ORGANIC CONSTITUENTS OF WELL WATER WITH CONCENTRATION CORRESPONDING TO FEDERAL AND STATE MAXIMUM CONTAMINANT LEVELS (MCLs) AND STATE ACTION LEVELS (ALs) FOR DRINKING WATER AT TNT LEACHING BEDS AREA, C ZONE WELLS

		Regulatory Limits for Drinking Water				Is concentration
		Federal	State		Maximum	> Federal/State
					Concentration	Standard ?
Constituent	Units	MCL	MCL	AL	µg/L	Y/N
Inorganics						
Arsenic	mg/L	0.05	0.05	--	12.8	N
Barium	mg/L	1.0	1.0	--	34.9	N
Copper	mg/L	1.0	1.0	--	<8.09	N
Mercury	mg/L	0.002	0.002	--	<0.2	N
Selenium	mg/L	0.01	0.01	--	<3.0	N
Zinc	mg/L	5.0	5.0		109	N
Volatile Organic Compounds						
trans-1,3-dichloropropene	µg/L				<0.250	--
Carbon tetrachloride	µg/L	5.0	0.5	--	<0.250/0.58	N
Chloroform	µg/L	--	--	--	1.23	--
1,2-dichloroethane	µg/L	5.0	0.5		<0.50	Y/N
Toluene	µg/L	--	--	100	<0.50	--
Methylene chloride	µg/L	--	--	40	8.49	--
Trichloroethene	µg/L	5.0	5.0	--	2.0	N
Extractable Organic Compounds						
bis(2-ethylhexyl)phthalate	µg/L	--	--	--	<4.8	--
2,4-dinitrophenol	µg/L	--	--	--	<21	--
2,4-dinitrotoluene	µg/L	--	--	--	<4.5	--

TABLE Q2-16 (Continued)

COMPARISON OF MAXIMUM CONCENTRATION OF INORGANIC AND ORGANIC CONSTITUENTS OF WELL WATER WITH CONCENTRATION CORRESPONDING TO FEDERAL AND STATE MAXIMUM CONTAMINANT LEVELS (MCLs) AND STATE ACTION LEVELS (ALs) FOR DRINKING WATER AT TNT LEACHING BEDS AREA, C ZONE WELLS

		Regulatory Limits for Drinking Water				Is concentration
		Federal	State		Maximum Concentration	> Federal/State Standard ?
Constituent	Units	MCL	MCL	AL	μg/L	Y/N
Explosives						
2,4-dinitrotuelene	μg/L	--	--	--	<0.612	--
HMX	μg/L	--	--	--	<1.65	--
RDX	μg/L	--	--	--	<4.18	--
Tetryl	μg/L	--	--	--	0.810	--
1,3,5-trinitrobenzene	μg/L	--	--	--	0.793	--
2,4,6-trinitrotoluene	μg/L	--	--	--	<0.588	--

TABLE Q2-17
SOIL CONTAMINANTS DETECTED AT THE 5-FOOT LEVEL
FOR THE TNT VEHICLE MAINTENANCE AREA SUBSITE

	SITE NUMBER					
	TNT-08-SB	TNT-09-SB	TNT-07-SB	TNT-10-SB	TNT-11-SB	CRL
COMPOUND	ug/g	ug/g	ug/g	ug/g	ug/g	
MOISTURE CONTENT (%)	6.8	4.0	1.9	1.6	3.9	
INORGANICS						
ARSENIC	5.16	5.78	3.55	8.86	2.9	<0.25
CHROMIUM	<12.7	<12.7	<12.7	<12.7	<12.7	<12.7
LEAD	29.5	13.1	<6.62	8.28	<6.62	<6.62
NICKEL	<12.6	<12.6	<12.6	<12.6	<12.6	<12.6
SELENIUM	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250
ZINC	<30.2	<30.2	<30.2	<30.2	<30.2	<30.2
EXPLOSIVES						
2,4-DNT	<0.424	<0.424	<0.424	<0.424	<0.424	<0.424
HMX	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666
RDX	<0.587	<0.587	<0.587	<0.587	<0.587	<0.587
TETRYL	<0.731	<0.731	<0.731	<0.731	<0.731	<0.731
1,3,5-TNB	<0.488	<0.488	<0.488	<0.488	<0.488	<0.488
2,4,6-TNT	<0.456	<0.456	<0.456	<0.456	<0.456	<0.456
VOLATILE ORGANIC COMPOUNDS						
TOLUENE	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
TRICHLOROETHENE	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003

Only analytes detected in site samples are listed on the table. A less than sign ("<") followed by the detection limit indicates that the analyte was not detected in the sample.

TABLE Q2-18. GROUNDWATER SAMPLE RESULTS
TNT LEACHING BEDS AREA*

COMPOUND	SITE NUMBER TNT-10-MWA ug/L	TNT-11-MWA ug/L	TNT-12-MWA ug/L	CRL
FIELD PARAMETERS				
pH (Std. Units)	7.19	7.72	7.55	
SPECIFIC CONDUCTIVITY @25C (umhos/cm)	1190	2420	1290	
WATER TEMPERATURE (deg. C)	15	17	14	
INORGANIC				
ARSENIC	12.0	15.2	28.4	<0.25
BARIUM	47.1	17.3	24.7	<5.0
CADMIUM	<4.01	<4.01	<4.01	<4.01
CHROMIUM	227	<6.02	<6.02	<6.02
COPPER	<8.09	<8.09	<8.09	<8.09
LEAD	3.8	1.5	2.28	<1.26
MERCURY	0.255	<0.2	<0.2	<0.2
SELENIUM	<3.0	9.16	3.41	<3.02
ZINC	<21.1	<21.1	<21.1	<21.1
VOLATILE ORGANIC COMPOUNDS				
TRANS-1,3-DICHLOROPROPENE (a)	<0.250	<0.250	<0.250	<0.250
CARBON TETRACHLORIDE (a)	>5.00	>5.00	<0.250	<0.250
CARBON TETRACHLORIDE	190	19	<0.58	<0.58
CHLOROFORM	923	41	0.749	<0.50
1,2-DICHLOROETHANE	101	0.82	<0.50	<0.50
TOLUENE	<5.00	<0.50	<0.50	<0.50
METHYLENE CHLORIDE	<23	<2.3	<2.3	<2.3
TRICHLOROETHENE	952	190	1.05	<0.50
EXTRACTABLE ORGANIC COMPOUNDS				
BIS(2-ETHYLHEXYL)PHTHALATE	<4.8	<4.8	7.1	<4.8
2,4-DINITROPHENOL	<21	<21	<21	<21
2,4-DINITROTOLUENE (b)	<4.5	<4.5	<4.5	<4.5
EXPLOSIVES				
2,4-DINITROTOLUENE (c)	<0.612	<0.612	<0.769	<0.612
HMX	<1.65	<1.65	<1.65	<1.65
RDX	<2.11	<2.11	<2.11	<2.11
TETRYL	<0.6	<0.6	<0.6	<0.6
1,3,5-TRINITROBENZENE	<0.626	0.867	1.12	<0.626
2,4,6-TRINITROTOLUENE	<0.588	<0.588	<0.588	<0.588

Notes:

(a) Results based on semiquantitative GC analysis.
(b) Result based on GC/MS analysis.
(c) Result based on HPLC analysis.
* Vehicle Maintenance Subsite, maximum reported values

TABLE Q2-19

CALCULATION OF ARITHMETIC AVERAGE AND 95TH PERCENTILE CONCENTRATIONS
OF CHEMICALS DETECTED IN SURFACE SOIL
TNT LEACHING BEDS SUBSITE

	Sample Identification Code												
	TNT-01-SS ug/g	TNT-02-SS ug/g	TNT-03-SS ug/g	TNT-04-SS ug/g	TNT-05-SS ug/g	TNT-05-SSDUP ug/g	TNT-06-SS ug/g	TNT-07-SS ug/g	TNT-08-SS ug/g	TNT-05(a) ug/g	Number of Values	Arithmetic Average mg/kg	95th Percentile Upper Bound mg/kg(95%)
Arsenic	3.6E+00	4.6E+00	5.9E+00	5.1E+00	4.2E+00	6.0E+00	3.5E+00	3.2E+00	3.0E+00	5.1E+00	8	4.3E+00	5.0E+00
Barium	1.3E+02	1.8E+02	3.4E+02	2.6E+02	2.2E+02	2.1E+02	2.1E+02	1.1E+02	1.1E+02	2.1E+02	8	1.9E+02	2.5E+02
Lead	1.9E+01	9.8E+00	2.0E+01	2.4E+01	9.1E+00	3.3E+00(b)	3.3E+00(b)	3.3E+00(b)	3.3E+00(b)	4.7E+00	8	1.1E+01	1.7E+01
Vanadium	2.1E+01	3.5E+01	4.8E+01	3.7E+01	3.4E+01	2.5E+01	3.4E+01	6.5E+00(b)	2.1E+01	2.9E+01	8	2.9E+01	3.8E+01
2,4 DNT	2.1E+00(b)	2.0E+01	8.3E+00	2.1E+00(b)	2.1E+00(b)	2.1E-01(b)	2.1E+00(b)	2.1E+00(b)	2.1E-01(b)	1.2E+00(b)	8	4.7E+00	9.1E+00
HMX	7.0E+00	2.3E+01	1.0E+01	3.3E+00(b)	3.3E+00(b)	3.3E-01(b)	3.3E+00(b)	3.3E+00(b)	3.3E-01(b)	1.8E+00(b)	8	6.5E+00	1.1E+01
RDX	3.1E+02	1.3E+03	3.7E+02	1.1E+02	2.9E+00(b)	2.7E+00	2.9E+00(b)	2.9E+00(b)	2.9E-01(b)	2.8E+00	8	2.6E+02	5.5E+02
1,3,5 TNB	1.1E+02	1.2E+02	4.8E+01	9.3E+01	4.3E+01	4.1E+01	2.3E+01	1.1E+01	1.4E+00	4.2E+01	8	5.7E+01	8.8E+01
2,4,6-TNT	1.2E+04	4.6E+03	2.2E+03	8.3E+03	9.8E+03	6.5E+03	5.9E+03	2.9E+02	7.8E+00	8.2E+03	8	5.1E+03	7.9E+03

(a) Arithmetic average of TNT-05-SS and TNT-05-SSDUP.
(b) Not detected, value is entered as 1/2 the detection limit.
(c) Calculated based on df=10 and α/2 0.975 = 2.306

TABLE Q2-20

CALCULATION OF ARITHMETIC AVERAGE AND 95TH PERCENTILE CONCENTRATIONS OF CHEMICALS DETECTED IN GROUNDWATER AT THE TNT LEACHING BEDS SUBSITE

Chemical	TNT-02-MWA µg/L	TNT-03-MWA µg/L	TNT-04-MWA µg/L	TNT-06-MWA µg/L	TNT-07-MWA µg/L	TNT-08-MWA µg/L	TNT-09-MWA µg/L	TNT-11-MWA µg/L	TNT-12-MWA µg/L	TNT-13-MWA µg/L	Number of Values	Arithmetic Average µg/L	95th Percentile Upper Bound[b] µg/L
	Sample Identification Code												
Inorganics													
Arsenic	7.36	10.3	8.1	9.7	15.4	13.3	8.96	15.2	28.4	13.6	10	13.03	17.12
Chromium	6.07	3.01[a]	3.01[a]	3.01[a]	9.5	3.01[a]	3.01[a]	3.01[a]	3.01[a]	3.01[a]	10	3.96	5.08
Lead	5.42	0.63[a]	0.63[a]	7.05	0.63[a]	5.21	10.7	1.52	2.28	9.44	10	4.29	6.87
Mercury	0.10[a]	0.10[a]	0.01	0.251	0.10[a]	0.10[a]	0.10[a]	0.10[a]	0.10[a]	0.526	10		
Selenium	4.05	1.51[a]	4.37	8.84	6.62	1.51[a]	1.51[a]	9.16	3.41	1.51[a]	10	4.25	6.26
Organics													
Carbon tetrachloride	0.29[a]	0.29[a]	0.29[a]	0.29[a]	0.29[a]	0.29[a]	0.29[a]	19.0	0.29[a]	0.29[a]	10	2.28	6.21
Chloroform	0.25[a]	0.25[a]	0.25[a]	0.25[a]	0.25[a]	0.25[a]	0.25[a]	41.0	0.749	0.553	10		
1,2-dichloroethene	0.25[a]	0.25[a]	0.25[a]	0.25[a]	0.25[a]	0.25[a]	0.25[a]	0.824	0.25[a]	0.25[a]	10	0.307	0.436
2,4 dinitrophenol	10.5[a]	17.5	10.5[a]	10.5[a]	10.5[a]	10.5[a]	10.5[a]	10.5[a]	10.5[a]	10.5[a]	10	11.2	12.619
HMX	3.76	7.69	0.825[a]	0.825[a]	0.825[a]	0.825[a]	0.825[a]	0.825[a]	0.825[a]	0.825[a]	10	1.805	3.318
RDX	250.0	220.0	1.05[a]	1.05[a]	1.05[a]	1.05[a]	1.05[a]	1.05[a]	1.05[a]	1.05[a]	10	47.84	113.94
1,3,5-trinitrobenzene	230.0	13.01	3.38	2.34	5.59	0.892	3.81	0.867	1.12	0.313[a]	10	26.132	74.07
2,4,6-trinitrotoluene	8.14	2.94	1.24	0.294[a]	0.294[a]	0.294[a]	0.294[a]	0.294[a]	0.294[a]	0.294[a]	10	1.438	3.81
TCE	3.52	0.25[a]	0.25[a]	0.25[a]	2.48	9.33	1.05	190.0	1.05	9.52	10	21.77	61.34
Tetryl	0.30[a]	0.30[a]	0.30[a]	0.30[a]	2.79	1.56	0.30[a]	0.30[a]	0.30[a]	0.30[a]	10	0.675	1.46

[a] Not detected, value is entered as 1/2 the detection limit
[b] Calculated base on df = 10 and $\alpha/2$ 0.975 = 2.228

Appendix Q3

Public Health Assessment-Toxicity Profiles

JMM James M. Montgomery
Consulting Engineers Inc.

The following toxicology profiles are contained in this section: Arsenic, Chromium, Lead, Mercury, Selenium, Zinc, Benzene, Carbon tetrachloride, Chloroform, Chlorobenzene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, Chloroform, Chlorobenzne, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,2-Dichloroethane, bis(2-Ethylhexyl)phthalate, 1,1,2,2-Tetrachloroethane, 1,1,1-Trichloroethylene tetrachloroethylene, Trichlorofluoromethane, Phenol, Toluene, Xylene, Aldrin, Chlordane, DDD, DDE, DDT, Heptachlor, Heptachlor epoxide, Dioxins/dibenzofurans, 2,4-Dinitrophenol, 2,4-Dinitrotoluene, HMX, RDX, Tetryl, 1,3,5-Trinitrobenzene, and 2,4,6-Trinitrotoluene.

ARSENIC

Arsenic toxicity depends upon its chemical form. In general, compounds containing As^{+3} (arsenites) have somewhat higher acute toxicity than compounds of As^{+5} (arsenates) (ATSDR 1989a, USEPA 1984). Readily soluble arsenic compounds tend to be somewhat more toxic than poorly soluble forms. However, conversions in valence state and solubility may occur both in the environment and in the body (USEPA 1988c), so valence state is usually not a critical consideration in evaluating the toxicity of arsenic compounds.

Noncarcinogenic Effects

Inhalation exposure to arsenic compounds in air can produce gastrointestinal irritation, but the effects are usually very mild. The chief effect is usually irritation to the skin and mucous membranes of the eyes, nose and throat (ATSDR 1989). Skin darkening and corns have been noted in workers who were exposed chronically to airborne levels of about 0.4 mg/m^3 (Perry et al. 1948), while levels of 0.1 to 0.2 mg/m^3 have been reported to cause mild skin irritation (Pinto and McGill 1953). Blom et al. (1985) concluded that the risk of neurological effects is minimal at exposure levels of 0.05 mg/m^3, and the ATSDR (1989) has estimated that chronic inhalation of 0.02 mg/m^3 poses minimal risk of noncarcinogenic effects in humans. The USEPA has not derived any inhalation RfDs for arsenic (USEPA 1990b).

Oral exposure to high doses of arsenic produces marked irritation of the gastrointestinal tract, leading to nausea and vomiting. Symptoms of chronic ingestion of lower levels of arsenic often begin with a vague weakness and nausea. As exposure continues, symptoms become more characteristic and include diarrhea, vomiting, decreased blood cell formation, injury to blood vessels, damage to kidney and liver and impaired nerve function that leads to "pins and needles" sensations in the hands and feet. The most diagnostic sign of chronic arsenic exposure is an unusual pattern of skin abnormalities, including dark and white spots and a pattern of small "corns," especially on the palms and soles (ATSDR 1989).

The average daily intake of arsenic producing the effects described above varies from person to person. Some individuals may ingest 0.15 mg/kg-day (10 mg/day in an adult) without any obvious ill effects, while doses as low as 0.02 mg/kg-day (about 1 mg/day in an adult) can produce one or more of the signs of arsenic intoxication in more sensitive individuals (Tseng et al. 1968, Cebrian et al. 1983).

Based on keratosis and hyperpigmentation of the skin reported by Tseng (1977), the USEPA has derived an oral RfD for arsenic of 1E-3 mg/kg-day for evaluating both subchronic and chronic oral exposure to arsenic (USEPA 1990a). This value is currently undergoing review (USEPA 1990a).

Carcinogenic Effects

The USEPA has classified arsenic as a Group A carcinogen (known human carcinogen) by the inhalation and oral routes (USEPA 1990b).

Lung Cancer

There have been a number of epidemiological studies in humans which indicate that chronic inhalation exposure to arsenic is associated with increased risk of lung cancer (USEPA 1984, ATSDR 1989). As with many epidemiological studies, confounding factors such as smoking and exposure to other lung carcinogens may complicate data interpretation, but the consistent findings among studies constitute convincing evidence that arsenic does increase lung cancer incidence. Increased lung cancer risk has been reported most frequently in smelter workers predominantly exposed to As^{+3} (e.g., Lee and Fraumeni 1969). Increased incidence of lung cancer also has been reported in worker populations exposed mainly to As^{+5} (Ott et al. 1974). Based on the combined results of several studies of exposed humans, the USEPA (1984) has calculated a unit risk of 4.3E-3 $(g/m^3)^{-1}$ (USEPA 1990b). Assuming inhalation of 20 m^3/day by a 70-kg adult, this corresponds to a SF of 1.5E+1 $(mg/kg\text{-}day)^{-1}$.

Skin Cancer

There is strong evidence from a number of human studies that oral exposure to arsenic increases the risk of skin cancer (USEPA 1984, ATSDR 1989). The most common type of cancer is squamous cell carcinoma, which appears to develop from some skin corns. In addition, basal cell carcinoma may also occur, typically arising from cells not associated with the corns. Although these cancers may be easily removed, they can be painful and disfiguring and can be fatal if left untreated.

The amount of arsenic ingestion that leads to skin cancer is controversial. Based on a study of skin cancer incidence in Taiwanese residents exposed mostly to As^{+5} in drinking water (Tseng et al. 1968, USEPA 1984), the USEPA has calculated a unit risk of 5E-5 [g/L (USEPA 1990b)]. Assuming intake of 2 L/day by a 70-kg adult, this corresponds to a SF of 1.75E+0 $(mg/kg\text{-}day)^{-1}$. This study has been criticized on several grounds, including uncertainty about exposure levels, possible effects of poor nutrition in the exposed population, potential exposure to other substances besides arsenic and lack of blinding in the examiners. Consequently, some quantitative uncertainty exists in the cancer slope factor derived from the Tseng data. Nevertheless, these criticisms do not challenge the fundamental conclusion that arsenic ingestion is associated with increased risk of skin cancer, and the Tseng study is considered to be the best study currently available for quantitative estimation of skin cancer risk (USEPA 1988c).

Other Cancers

Although the evidence is limited, there are some reports which indicate that chronic oral arsenic exposure may increase risk of internal cancers, including cancer of the liver, bladder and lung (Chen et al. 1985, 1986, 1988a, 1988b). This is supported by limited evidence that inhalation exposure may also increase risk of gastrointestinal, renal or bladder cancers (Lee-Feldstein 1983, Enterline and Marsh 1982).

Low-Dose Detoxification of Arsenic

Most evaluations of cancer risk from a chemical depend on extrapolation from high dose to low dose, and it is usually assumed that the dose-response curve is linear in the low-dose region. In the case of arsenic, some researchers have suggested that arsenic is effectively detoxified by metabolic methylation at low doses, leading to a nonlinear dose response curve (Marcus and Rispin 1988, Loehr et al. 1989). If so, low dose cancer risk estimates based on an assumed linear relationship are likely to be too high. The USEPA (1984) has carefully considered all the available data on metabolic detoxification of arsenic, along with other relevant considerations, and has concluded that a more complete understanding of these data is needed before they can be factored with confidence into the cancer risk assessment process for arsenic.

Beneficial Effects

Several studies in animals suggest that low levels of arsenic in the diet may be beneficial for reproduction and normal postnatal development (Schwartz 1977, Anke et al. 1978, 1987, Uthus et al. 1983). However, these studies were not well controlled, and some researchers believe the data are not adequate to show that arsenic is beneficial (Solomons 1984, Hindmarsh and McCurdy 1986). The USEPA (1988d) has carefully reviewed the evidence and concluded that the essentiality of low levels of arsenic in animals has not been established but is plausible.

If arsenic is beneficial or essential in animals, it is also likely to be so for humans. Based on the animal data, the estimated beneficial dose for humans is approximately 10 to 50 [g/day (USEPA 1988c). This level of arsenic intake is usually provided in a normal diet, and no cases of arsenic deficiency in humans have been reported (ATSDR 1989).

CHROMIUM

The principal use for pure chromium (Cr) is in the metal plating industry. Many household appliances and other manufactured items including automobiles are chrome plated. It is used for alloying with several other metals and is used in radiological medicine.

Chromium is reported in ranges from 35 to 200 mg/kg in the earth's crust and occurs in the ocean at a level of 0.0005 mg/l. A USGS Survey showed a general range for surface water of 0.006 to 0.05 mg/l of hexavalent chromium Cr (IV) as trivalent chromium salts Cr (III) are insoluble.

The U.S. EPA drinking water standard for Cr (VI) in drinking water supplies is 0.05 mg/l.

Cr is essential nutrient for animals, being required along with insulin for the metabolism of carbohydrates. The average daily dose is around 1 mg per day. Excess Cr is rapidly excreted by the body and therefore, not cumulative in the body.

Cr occurs in oxidation stages ranging from Cr (II) to Cr (VI), but only Cr (III) and Cr (VI) are of biologic importance. There is no evidence that trivalent will form in biological systems but hexavalent Cr readily crosses cell membranes and is reduced intracellularly to trivalent Cr.

The known adverse health effects have been attributed to the hexavalent form. Acute systemic toxicity may result may result from accidental exposure during previous therapeutic uses or suicide attempts. The major effect from ingestion of Cr (VI) is acute renal (kidney) tubular necrosis.

Cr (VI) is corrosive and causes chronic ulceration and preformation of the nasal septum and other skin surfaces. Cr (III) is considerably less toxic and is neither irritating or corrosive.

Systemic Health Effects of Chromium III

Chromium (III) compounds generally do not produce increased mutation rates in microbial test systems. In one study, chromium (III) was weakly mutagenic in Bacillus subtilin (U.S.EPA, 1984a). Several mammalian cell assays have indicated chromosomal alterations due to chromium (III), however, contradictions have been reported (U.S. EPA, 1984a).

The NOEL is divided by a safety factor of 1,000 to yield an ADI of 1.467 mg/kg/day, or 102.7 mg/day. The target concentration in water and air are 51.4 mg/l and 0.41 mg/m3, respectively.

Systemic Health Effects of Chromium

Chromium (VI) is more toxic than chromium (III) following both acute and chronic exposures. Chromium (VI) compounds are very strong skin irritants and sensitizers. These compounds have been demonstrated to produce nasal irritation, skin ulceration, irritant dermatitis and allergic contact dermatitis in humans. Nasal irritation in workers has been

observed at airborne (soluble) chromium (VI) concentrations of 0.068 mg/m3. At higher concentrations, perforations of the nasal septum have been observed. Chrome skin ulcers are deep round holes that develop at sites where hexavalent chrome compounds a redeposited on broken skin. Favored sites for ulcer development include nail root areas, knuckles and finger webs, and on the back of hands and forearms. The ulcer heals slowly and may persist for months. Allergic dermatitis may result after one or more exposures to chromium (VI). Subsequent exposures result in dermatitis are of varying severity. Allergic eczematous dermatitis due to chromium VI has been described in a variety of people, including those without occupational exposure. Skin patch tests indicate that 8-15% of all patients suffering from eczematous dermatitis react positively with chromium. In some individuals, chromium (chromate) sensitization has resulted in asthmatic attacks upon subsequent reexposure (U.S.EPA, 1984b).

In occupational settings, chromium (VI) exposure has resulted in local lung effects such as pneumoconiosis and acute upper respiratory disease. There have been reports of kidney damage in workers where chromium (VI) was absorbed through damaged skin (which can be sustained due to the irritant effects of chromium (VI), as described previously. In adults, ingestion of 1 to 2 grams of chromate has resulted in kidney and liver damage that appears 1 to 4 days following ingestion. Ingestion of about 5 grams of chromate results in the appearance of liver and kidney damage within 12 hours of the intake. Gastrointestinal bleeding and massive fluid loss may also occur after this exposure (U.S EPA, 1984b).

No studies on possible teratogenic effects resulting from ingestion of chromium are available (IRIS, 1988).

Carcinogenic Effects of Chromium VI

Hexavalent chromium compounds have produced excess tumors in several animal bioassays, although chromium (VI) has not produced lung tumors following inhalation exposures (IRIS, 1988).

Workers employed in chromate production have had increased incidences of lung cancer. ACPF of 41 (mg/kg/day) rrom the inhalation route has been estimated from chromium (VI) by EPA's Cancer Assessment Group based on an epidemiology study performed by Mancuso (1975).

A review of the histologic classification of lung cancer cases in chromate workers attributed the greatest risk to cancer due to acid-soluble, water-insoluble Cr (VI) rather than trivalent compounds. Other studies have supported this hypothesis.

A slight increase in cancer of the gastrointestinal tract has been reported in other studies, but each involved only a small group of workers. Animal studies support the human data that Cr (VI) is the carcinogenic chromium compound. Trivalent compounds have little to nomutagenic activity in bacterial systems.

EPA classifies chromium (VI) as a Group 'A', human carcinogen by inhalation. There are no studies indicating that chromium VI is carcinogenic following ingestion exposure (IRIS,1988). Studies have found in vivo conversion of Cr (VI) to Cr (III) and the reverse. Therefore exposure to one form involves exposure to both.

Pharmacokinetics

Chromium (III) compounds are not readily absorbed relative to chromium (VI) salts by either inhalation or oral routes of exposure. In the gastrointestinal tract, about 0.4% chromium (III) and 10% chromium (VI) is absorbed (U.S. EPA, 1984a). Chromium is bound by constituents in the gastric juices which reduce intestinal uptake. Absorption also occurs through the skin with diffusion constants reported to be 314 x 106 cm2/min andΘ 26.6 x 106 cm2/min for hexavalent and trivalent chromium, respectively (Mali, 1963).
Factors influencing dermal absorption include the chromium salt employed, the valencestate (III or VI), anionic form, concentration and pH (U.S. EPA, 1984a).

Once absorbed, chromium (III) is transported by binding to proteins in the blood. Chromium (VI), however, crosses the red blood cell membrane where it can bind to cellular compounds or undergo reduction to chromium (III). Chromium (III) is cleared rapidly from the blood and slowly from tissues, while chromium (VI) is distributed to the liver,spleen, bone marrow, lung and kidney. There is some indication that accumulation mayalso occur in the testes, brain and heart.

Excretion primarily occurs through the urine (about 50-60%) with some fecal elimination (about 8%) (U.S. EPA, 1984c). The remainder is deposited in various tissue compartments and has a long biological half-life. Chromium (VI) is eliminated much faster than Cr (III). Adipose and muscle tissue retain chromium for about 2 weeks while liver and spleen tissue retain chromium for about 1 year.

Human Epidemiology Studies of Chromium VI

Epidemiological studies of chromate production facilities in the United States, Great Britain, Norway, Japan and West Germany have established an association between chromium exposure and lung cancer. Most of these studies did not establish whether chromium (III) or chromium (VI) was the causative agent. Three studies of workers in the chrome pigment industry also found an association between occupational chromium (predominantly hexavalent) exposure, and lung cancer (IRIS, 1988).

Mancuso (1975) divided a 332-member cohort into three groups of workers who began work between 1931 and 1932, between 1933 and 1934, and between 1935 and 1937. Of all the cancer deaths in the cohort up until 1974, 63.6 percent, 62.5 percent and 58.3 percent were attributed to lung cancer in the first, second and third groups, respectively. Workers were exposed to both chromium (III) and chromium (VI) and, therefore, the risk estimation for chromium (VI) is actually based on exposure to total chromium.

LEAD

ACUTE EFFECTS

Many neurotoxic effects are associated with lead intoxication. In children, acute encephalopathy can result from blood lead levels greater than 80 $\mu g/dl$. It is initially characterized by irritability, loss of memory and inability to concentrate. It can progress to delirium, convulsions, coma and death (EPA, 1986).

At high lead exposure, the gastrointestinal system is one of the earliest to show symptoms of acute lead intoxication. Colic (acute abdominal pain) is a consistent early symptom of lead poisoning. It is most often seen in cases of occupational lead exposure, and has been observed in workers with blood lead levels exceeding 40 $\mu g/dl$ (ATSDR, 1988).

SYSTEMIC HEALTH EFFECTS

Inorganic lead is primarily absorbed through the gastrointestinal tract and the lungs. Absorption through the skin appears to be limited. The absorption of lead in the gastrointestinal tract is dependent upon numerous factors including: the age and nutritional status (e.g., iron, zinc, and calcium stores) of the individual ingesting the lead, how recently the individual has eaten, and the form of the lead (e.g., solubility and particle size). It has been estimated that, on the average, 6-15 percent of normal adult dietary lead (including beverages) is absorbed (EPA, 1986).

Toxic effects resulting from lead exposure area well documented and many have been associated with a range of blood-lead (PbB) levels. Children have been found to develop symptoms at lower PbB levels than do adults. Dose related toxic effects are observed in the following areas: heme synthesis and hematological (blood system) effects, neurological system, kidney, reproduction/development, and the cardiovascular system.

Central Nervous System Effects

Less severe neurotoxic effects have been observed at lower blood lead levels. For example, decreased nerve conduction velocities, indicative of peripheral nerve dysfunction, have been noted in children and adults at blood levels of 30 to 40 $\mu g/dl$ (ATSDR, 1988). Recently, it has been determined that blood lead levels as low as 30 to 40 $\mu g/dl$ are associated with IQ deficits and other central nervous system effects in children. Altered auditory and electrophysiological responses have been observed in children at blood lead levels of 15 $\mu g/dl$.

Neuro behavioral deficits have been observed in infants and young children with blood lead levels of 10-15 $\mu g/dl$, although these may be reversible in later years is exposure ceases. A variety of behavior changes, developmental delays in motor abilities, and learning deficits have been observed in young animals with prenatal or early postnatal lead exposures (ATSDR, 1988).

Hemolytic Effects

Blood lead can have many diverse effects due to its interference with the synthesis of heme, a compound that functions in many tissues including blood, kidney, liver and nerves. Lead interference with heme synthesis, as indicated by elevated levels of erythrocyteprotoporphyrin (EP), has been associated with blood lead levels of 15-30 μg/dl in adults and 15 μg/dl in children. Changes in heme synthesis enzyme activity levels have been observed at blood lead levels as low as 10 μg/dl , although it is not clear whether this has any physiological effects. In the blood, heme is a critical component of hemoglobin, the protein that transports oxygen *throughout the* body. Anemia, a functional and potentially serious deficit in the amount of hemoglobin has been observed at 80 μg/dl blood lead in adults and 70 μg/dl blood lead in children. In the kidney, reduced heme content results in reduced vitamin D metabolism, which in turn, interferes with several hormonally regulated effects. In the liver, reduced heme synthesis may result in the impairment of detoxification of toxic organic compounds and drugs, as the P450 metabolism enzymes require heme as a cofactor (ATSDR, 1988).

Toxic effects resulting from chronic lead exposure are well documented and many have been associated with accompanying blood-lead (PbB) levels. Children have been found to develop symptoms at lower PbB levels than do adults. The most serious effects associated with lead intoxication are the neurotoxic effects. Lead encephalopathy can result from blood lead levels greater than 100 μg/100 ml and is characterized by irritability, loss of memory and ability to concentrate, delirium, hallucinations, cerebral edema, and coma (EPA, 1980). Less severe neurotoxic effects have been observed at lower blood lead levels. For example, lowered nerve conduction velocities, indicative of peripheral nerve dysfunction, have been noted in adults at blood levels of 30 to 40 μg/100 ml (EPA, 1985).

Hematologic effects appears to be among the most sensitive indicators of lead absorption. Lead interference with heme synthesis has been noted in humans and other mammalian species at levels below 10-15 μg/100 ml. The step most sensitive to lead in the heme synthetic pathway is that mediated by the enzyme 7-aminolevulinic acid dehydratase (7-ALAD), although the health significance of 7-ALAD inhibition at low blood-lead levels is unclear. Lead can also lead to the accumulation of porphyrin in erythrocytes with elevated levels of erythrocyte protoporphyrin (EP) associated with blood lead levels of 25-30 μg/100 ml in adults and 15 μg/100 ml in children (EPA, 1985). Anemia is characteristic of more severe cases of lead, poisoning, resulting from erythrocyte destruction and reduced hemoglobin synthesis (EPA, 1977).

Nephrotoxicity

Renal (kidney) toxicity has been observed in victims of lead intoxication. Reversible proximal tubule damage has been observed primarily in cases of short exposure. Reduced glomerular function has been associated with chronic exposures and blood lead levels ranging from 40 to more than 100 μg/dl (EPA, 1986).

Cardiovascular Effects

Cardiovascular effects, including increased blood pressure and hypertension, have been associated with lead exposure to adults. The EPA (ATSDR, 1988) considers that sufficient evidence exists from four large-scale general population studies, as well as smaller studies, to make the following conclusions: "that a small but positive association exists between blood lead levels and increases in blood pressure. Quantitatively, the relationship appears to hold across a wide range of blood lead values, extending possibly down to as low as 7 $\mu g/dl$ for middle-aged men."

REPRODUCTIVE EFFECTS

Several occupational studies have suggested a relationship between lead exposure and adverse reproductive effects in both women and men. However, the data were all obtained at moderate to high lead exposure levels, and the number of individuals was small. These studies are not considered definitive (EPA, 1986). Animal studies, primarily in rodents, also indicate there are adverse reproductive, but not teratogenic, effects following chronic exposure to lead in food and/or drinking water (EPA, 1986). Delays in neuro behavioral development were described previously. Other developmental effects that have been associated with lead exposure include low birth weight and decreased gestational age, which occurs at maternal blood lead levels above 12-14 $\mu g/dl$, and reductions in childhood growth (IRIS, 1989).

An approach to determining hazard-associated levels of lead in soil is the determination of lead soil levels that are not associated with elevated blood lead levels in children. According to the report "Preventing Lead Poisoning in Young Children" (ATSDR, 1988): lead in soil and dust appears to be responsible for blood lead levels in children increasing above background levels when the concentration in the soil or dust exceeds 500-1000 ppm.

CARCINOGENIC EFFECTS

Inhalation

The EPA has concluded that inorganic lead is a probable human carcinogen, with a weight of evidence classification of B2. Although human evidence is inadequate, several animal bioassays have shown statistically significant increases in renal tumors following dietary and drinking water exposure to lead acetate or lead subacetate, two soluble lead salts (IRIS, 1989). No quantitative cancer potency factor has been derived for lead because of the large uncertainties involved in the derivation, including the effect of age, health, nutritional status and body burden (IRIS, 1989). Lead has been associated with several mutagenic and other genotoxic effects under certain conditions.

All studies regarding exposure to lead do not report quantified exposure concentrations and are further limited due to smoking and exposure to other metals. Two studies found no association between exposure to lead and cancer mortality (Dingwall-Fordyce and Lane, 1963; Nelson et al, 1982); one found a slight association (Selevan et al, 1985); and one found

a significant excess of total cancer mortality (Cooper and Goffey, 1975; Cooper 1985 update).

The animal evidence is considered sufficient to classify it as a probable human carcinogen. Statistically significant increases of renal tumors associated with oral exposure to lead have been reported in 10 bioassays in rats and one in the mouse. Results have been reproduced in several laboratories in several strains of rats with evidence of multiple tumor sites (IRIS,1989).

INGESTION

Two two-year feeding studies in rats were conducted by Azar et al., (1973). Exposure concentrations ranged from 10 to 2,000 ppm of lead acetate. Male rats in exposure groups of 500 ppm and above exhibited an increased incidence of renal tumors. No tumors were observed in rats of either sex at 10 to 100 ppm or in control groups. The study is limited however, by each of experimental detail.

Koller et al., (1986) also reported an increased incidence of renal tumors in male rats at a dietary exposure concentration of 2,600 ppm of lead in lead acetate. Eighty-one percent of the rats of the treatment groups had renal tumors after 76 weeks of exposure.

Male rats were fed 8,500 ppm for 79 weeks in a study by Kasprzak et al., (1985). Approximately 45 percent of surviving treatment group rats had renal tumors.

One study (Van Esch and Kroes, 1969) reported a low incidence of renal tumors in treatment group of 1.0 percent lead acetate. The investigator felt that the low incidence of renal tumors was due to early mortality. No significant increase of renal tumors was observed in hamsters at 0.5 percent and 1 percent dietary concentrations.

MERCURY

Mercury is a transition metal and, in its elemental state, occurs at room temperature as a liquid. It is commonly produced as a byproduct to gold mining and is produced from mining operations. It is commonly used in thermometers, barometers and other pressure-sensing devices and in electrical components. World production of mercury exceeds 6.5 million kilograms annually.

Mercury occurs naturally in the environment and is distributed throughout the world. It occurs in three valence states; as a metal and various inorganic and organic complexes. It is discharged into the environment in the form of gaseous emissions, various salts in industrial processes, and is capable of bioaccumulation into terrestrial and aquatic food chains. A saturated atmosphere of elemental mercury can contain up to 18 mg/m^3 and it can exist in the monatomic state as a vapor. Inorganic mercury (Hg^{+1} and Hg^{+2}) readily forms complexes with organics, especially sulfhydryl groups and can form salts with organic and inorganic acids. Organic mercury consists of primarily methyl, ethyl, phenyl and alkoxyalkyl mercury compounds in the form of organic and inorganic acid salts. The compounds readily bioaccumulate due to their lipophilic nature and can interact with biologically significant ligands. These compounds are capable of passing placental barriers.

Acute Effects

Acute human exposure to high concentrations of mercury vapor results in loss of respiratory function and death due to pulmonary tissue necrosis and edema (Teng and Brennan, 1959). Organic mercury exposure involving diethylmercury at concentrations up to 1 mg/m^3 for up to four months resulted in death with major tissue damage being in the gastrointestinal tract. Acute inhalation exposure of mercury vapor and organic mercury to experimental animals results in death due to pulmonary edema.

Inhalation of metallic mercury vapor results in systemic toxicity to humans and experimental animals. The effects are dose related such that at low levels, the central nervous system and kidney are target organs while at higher doses, the respiratory tract, cardiovascular and gastrointestinal organs are targeted. Respiratory effects in humans and rodents include pulmonary edema, lobar pneumonia, desquamation of bronchiolar epithelium, necrosis and death (Ashe et al. 1953). Cardiovascular effect include initial increase in blood pressure followed by degeneration and myocardial necrosis. Gastrointestinal effects include nausea, vomiting, gingivitis, mercurial stomatitis and necrosis of the intestinal mucosa (Lillis. 1985). Renal effects include proteinuria, hematuria, degeneration of the convoluted tubules and death (Campbell, 1948). Creatine excretion increased in exposed individuals with increasing dose suggesting that this marker might be a useful gauge for the level of mercury exposure (Buch et al. 1980). In rodents, renal tubular epithelium degeneration is noted at moderate doses (3 mg/m^3) (Kishi et al. 1978). Based on these studies, a level of from 1 to 3 mg/m^3 resulted in a LOAEL.

The central nervous system is a major target organ for elemental mercury exposure. Elemental mercury rapidly passes the blood-brain barrier and can exert toxicity based on conversion to inorganic forms and interaction with sulfhydryl groups in the neuronal tissue. Acute exposure results in excitability, tremors, decreased motor and muscular function, headache, visual disturbances, ataxia, dysarthria and with severe exposure, paralysis an death (Cassarett and Doull, 1986; Hanninen, 1982). Chronic exposure to elemental mercury results in tremors, loss of short-term memory, decreased psychomotor skill and general neurological dysfunction that becomes irreversible after prolonged exposure (Fawer, et al. 1983). Elevated urinary excretion of mercury generally correlates with neurological symptoms. Due to the cumulative nature of mercury intoxication, a chronic inhalation MRL of 0.00026 $mg/^3$ has been suggested for a long-term exposure level of atmospheric mercury.

Rodent exposure to metallic mercury results in neurological and behavioral effects similar to those manifested in humans although rodents appear less sensitive than humans to mercury inhalation (Armstrong, 1963; Ganser and Kirschner, 1985)

Investigations in humans following prenatal exposure to mercury suggests increased spontaneous abortion and menstrual disturbances. Due to the rapid absorption of mercury via inhalation, transfer of mercury from maternal blood to maternal milk can result in neonatal exposure to mercury (Cassarett and Doull, 1986).

Elemental mercury vapor caused increased fetal toxicity in rodents. the number of resorptions and fetal mortality increased with treatment groups. Rat exposed to doses of 0.5 mg/m^3 during days 10 to 15 of gestation resulted in increased resorptions and increased skeletal malformations (Steffek et al. 1987). Based on rodent and human data, mercury exposure during mid to late pregnancy could result in developmental and/or reproductive toxicity.

Chronic Exposure

Chronic exposure to elemental mercury vapor results in prolonged neurological symptoms which include tremors, loss of memory, decreased psychomotor skill and neurological dysfunction (Fawer, et al. 1983). Increased urinary excretion of mercury and the development of proteinuria indicate chronic mercury intoxication as does the elevated creatine excretion (Ganser and Kirschner, 1985).

Genotoxicity

Genotoxic effect of elemental and inorganic mercury via inhalation include elevated chromosomal abnormalities in lymphocytes. conflicting report indicate the potential for development of both chromosomal aberrations and aneuploidy in humans. Bone marrow chromosomal aberrations have been demonstrated in mice exposed to organic mercury vapors. Shot-term mutagenicity assays in various cultured cells indicate a lack if direct mutagenic activity of mercury or mercury salts.

Carcinogenicity

Based on fairly extensive human epidemiological investigations, there is no correlation between occupational mercury exposure and increased tumor burden. There is no experimental animal data or bioassays that indicated that various forms of mercury could enhance tumor development in rodents. Based on these data, U.S. EPA has classified mercury as a class D compound and there are n cancer potency values for mercury (IRIS, 1989).

SELENIUM

Selenium toxicity depends on total body levels since its deficiency and excess result in several disorders (ASTDR, 1989). The nature of the toxicity does not appear to correlate with the oxidation state of selenium but absorption and bio-availability depend on the form of selenium (e.e. organic or inorganic).

Non-carcinogenic Effects

Low body and tissue levels of selenium result in diminished glutathione peroxidase enzyme activity in whole blood and erythrocytes which adversely effects the protection of cells from oxidation damage (Valentine et. al, 1988). Depressed selenium levels result in at least two chronic, non-cancerous, metabolic diseases: Keshan disease and Kashin-Beck disease (Yang et. al, 1988). Keshan disease manifests its symptoms by increased necrosis of the myocardial muscle, while Kashin-Beck disease results in degeneration, atrophy, and necrosis of cartilage. Low selenium intake in other instances results in increased cardiomyopathy resulting in increased cardiovascular deaths in man (Oster et. al, 1983; Salonen et. al, 1982).

Excessive body levels of selenium manifest their symptoms as increased garlic breath, increased skin rashes, dental carie increase, brittle and discolored nails, hair loss and increased nervous system disorders (Kilness and Hochberg, 1977; Yang et. al, 1983). Severe selenosis can result in chronic nervous system degeneration and depression.

In rodent species, oral ingestion of selenium and selenium salts produce acute toxicity to mice, rats, guinea pigs, and rabbits (ASTDR, 1989. Nonlethal doses of selenium sulfide or selenium disulfide result in pulmonary edema and respiratory congestion (Carter, 1966; Koppel et. at, 1986). Ingestion of high levels of selenacious plants results in respiratory failure in livestock (NAS, 1976a).

Oral dosage of mice and rats with selenium salts results in myocardial hyperemia, hemorrhage, and degeneration, and pericardial edema (Schroeder and Mitchener, 1972). In chronic exposure settings with mice, myocardial amyloidosis of the heart was observed but the significance of this finding is unclear.

Severe gastrointestinal distress, abdominal cramping and fluid imbalance result from acute dosage with selenium salt in humans (Koppel, 1986). Livestock suffering from "blind staggers" exhibit severe gastrointestinal distress and upon necropsy, pronounced gastrointestinal necrosis (Shamberger, 1986). Gastrointestinal disorders in rodents fed grains high in selenium resulted in NOAELs of 0.5 mg/kg/day (ASTDR, 1989).

Limited investigations in humans suggest that hepatic effects occur following short-term and chronic ingestion of selenium compounds. Abnormal liver function (serum bilirubin and alkaline phosphatase activity) has been demonstrated in one patient (Civil and MacDonald, 1978).

Hepatic congestion in ruminants and rodents have been noted (Hoppee et. al, 1985; Palmer and Olsen, 1974). Chronic exposure to selenium compounds in rodents also results in depressed liver weight and eventually cirrhosis (Harr et.al, 1967) (NOAEL 0.68 mg/kg/day).

Selenium intoxication has resulted in effects on other organ systems in rodents and humans. Renal effects such as nephritis and severe interstitial nephritis and any lordosis have been noted following oral ingestion of selenium compounds (Harr et. al, 1967). Oral ingestion of selenium has been associated with delayed eye lid development in mice (Ostadalova and Babicky, 1980).

Reproductive and Developmental Effects

There have been no investigations demonstrating that selenium or selenacious containing plants induce developmental anomalies in humans (ASTDR, 1989). Selenium does not induce terata in rodent species under very stringent conditions (Barlow and Sullivan, 1982). Avian species appear to be highly susceptible to selenium induced terata (Palmer et. at, 1973). Selenium ingestion elicits decreased fetal body weights in rats and mice and impairs fertility and conception rates in rodents (Chowdhury and Venkatakrishna-Ghatt, 1983). Selenium also decreases fecundacy in swine (Wahlstrom and Olson, 1959b). Recent investigations in primates indicate that selenium does not induce fetal malformations under continuous dosing prior to conception through parturition (Tarental et al, in press).

Genotoxic and Carcinogenic Effects

Selenium by itself has not been shown mutagenic in bacterial or mammalian cell mutagenesis assays (ASTDR, 1989). In fact, the presence of selenium in the mutation assays as a media supplement or as an adjunct to the S9 metabolic activation system decrease mutegenic activity of known mutagens (Gairola and Chow, 1982).

Selenium and selenium containing plants do not enhance the development of tumors in humans (ASTDR, 1989). In fact, in areas where high indigenous selenium occurs in the diet, tumor rates for tongue, esophagus, stomach, intestine, rectum, liver, pancreas, lung and bladder are significantly lower in males and females than in low selenium exposure diets (Shamberger et. at, 1976). The possible mechanism may relate to effects on glutathione peroxidase levels (Valentine et. al, 1988).

Carcinogenicity data in rodents for dietary selenium present conflicting results. Early reports indicate that sodium selenate or selenacious plant material enhanced hepatic tumor incidence in rodents (Volgarev and Tscherkes, 1967; Schroder and Mitchener 1971a). Later reports indicate that dietary selenium inhibits spontaneous tumor development or chemically induced (N-2-fluorenylacetamide) tumors (Harr et.al, 1967). Selenium sulfide is the only compound known to consistently increase tumor incidence in the form of hepatocellular carcinomas and alveolar/bronchiolar carcinomas in rats and mice (NTP, 1980c). Selenium sulfide is only used in topical pharmaceutical preparations and not taken orally. Lastly, in 1975, IARC concluded from the literature that selenium in the forms of selenite, selenate, and organic forms was non-carcinogenic to rodents and humans and is not considered to be a carcinogen.

ZINC

Systemic Health Effects of Zinc. As the zinc ion is too poorly 00 absorbed to induce systemic intoxication, zinc compounds are relatively non-toxic by mouth. Zinc is an essential component of numerous enzyme systems of diverse activities in the body. Zinc has also exerted protective effects in many disease states (Klaasson, 1986).

In brass foundry workers, zinc oxide was found to produce zinc fume fevers due to inhalation of fumes during manufacturing processes. Clinical recovery is usually complete in 24 to 48 hours. Chronic exposure to fumes has not shown adverse effects (NIOSH, 1976).

Fine salt of strong mineral acids can be corrosive to the skin and irritating to the gastrointestinal tract. However, the use of zinc oxide in many topical dermatologic preparations has demonstrated a low potential for skin irritation. An occupational dermatitis "Oxidepox" was reported by Mogelivskaya in workers. The author concluded that zinc oxide particulate and lack of personal hygiene contributed to the minor eruptions. These were reversible with the institution of good hygiene practices (Clayton, 1981).

Gastrointestinal disturbances with peptic ulcer-like symptoms have been supported in workers employed for years in brass foundries (Clayton, 1981).

Clinically latent liver dysfunction has been reported in workers exposed to high levels of zincoxide. Evidence of peptic ulcers was felt to be indicative of gastrointestinal tract damage(NIOSH,1976).

Zinc is a nutritionally essential metal and deficiency results in several health consequences.Excessive exposure to zinc is relatively uncommon and requires very heavy exposure.

BENZENE

The occurrence of benzene in the environment is through both natural sources and coal and oil production. It is component of gasoline and issued as an ingredient in the production of plastics, detergents and pesticides. Some paint strippers and cleaning products contain benzene. Since benzene in a gas at normal temperatures, human exposure in most likely to occur through inhalation. Ingestion of contaminated water is also a route of exposure.

Acute Effects of Benzene. Death due to inhalation of high benzene concentrations has been documented. In these cases, a tank spill or intentional misuse of benzene containing products has caused CNS depression or cardiac arrythmia.

For exposures to high concentrations which are below lethal levels, the central nervous system is the organ of concern. Liquid and vapor can irritate the mucus membranes. Contact with liquid can cause an itching dermatitis. Headache, dizziness, nausea can occur.

Through inhalation studies of animals the LC 50 was found to be 13,700 ppm for a 4 hour exposure (Drew and Fouts, 1974). Lethality to humans by inhalation has been estimated at 19,000 to 20,000 ppm for a 5 to 10 minute exposure (Sandmeyer, 1981).

Benzene is considered to be of low acute toxicity to animals when ingested (O'Bryan and Ross, 1986). In rats the lowest LD found is 930 mg/kg. In humans, concentrations in the range of 10 ml up to 30g of benzene has been estimated to be a lethal dose (Thienes and Haley, 1972 and Von Oettingen, 1940, as reported in Sandmeyer, 1981). When converted to weight per weight, the LOAEL for human lethality is 128 mg/kg.

Systemic Effects of Benzene

Inhalation Exposure. At lower exposu: : concentrations, the hematopoietic, immune and neurological systems are the organs most vulnerable to benzene. Humans have shown a decrease in various blood cell counts, due to bone marrow depression. As the blood composition is altered so is the organisms immune response. These studies are verified by animal testing.

Numerous animal studies have shown bone marrow depression due to damage of the stem cells in white and red blood cell production. The result is a decrease in the number of circulating blood cells (pancytopenia). The bone marrow depression can advance to myelogenous leukemia which will be discussed under carcinogenic effects.

Animal studies conducted by Li (1986) examined blood in female rats exposed to 0 to 3,000 ppm benzene for 8 hours per day for 7 days per week. At 20 ppm, leucocyte counts were significantly inhibited. At 300 ppm, leucocyte enzyme levels were increased. Similar studies by Rozen, et al. in 1984, focussed on different cells of the blood. Red blood cells and lymphocytes counts were depressed. Of the varying cell types in the blood, the lymphocyte was found to be the most sensitive. Lymphocytes are critical to the immune response. The granulocytes were found to be the most resistent cell type. It is hypothesized that metabolites of benzene, not benzene are the most toxic form.

The hematotoxic effects of benzene inhalation are also observed in studies of humans. Hypoplasia of the bone marrow and a resulting decrease in various cells of the blood is noted. Aksoy (1972) studied workers exposed to 150 to 650 ppm for 4 months to 15 years. Severe blood disorders were observed.

An impact on the immune system has also been noted in animal studies. Studies of the erythroid celline found a decrease in the incorporation of 59 Fe into bone marrow precursors and developing erythrocytes. Valle Paul and Snyder (1986) demonstrated that repeated exposure to 10 ppm of benzene reduced progenitor red cells in mice.

The cause of pancytopenia may be due to destruction of bone marrow cells impairment of cell differentiation or destruction of cell precursors and circulating cells, (Goldstein, 1971). Benzene induced myelo suppression was investigated by Kalf et al. 1987. Post et al. 1985 the impact of benzene on DNA and RNA synthesis.

The impact of benzene inhalation on the human immunological system is indicated by alteration of the immunoglobulin levels. B and T cell antibody production decreases (Lange et al, 1973; Roth, et al, 1972; Smolik, 1973 as reported in Goldstein, 1986). Rozen et al (1984) showed that B cells derived in bone marrow and splenic T cells had a decreased proliferative response following short term inhalation exposure.

The neurotoxic effects of benzene are similar to the acute effects. Low level, long term exposure to benzene through inhalation has caused CNS lesions in human (Brzecki et al, 1973 as reported in Sandmeyer, 1981).

Oral Exposure. A study of benzene by rats over a 6 month period of doses ranging from 0 to 100 mg/kg/day showed that the hematological damage should also be caused through ingestion. Leukopenia was slight at the 20 mg/kg/day dose and increased with increasing doses.

No data has been found on the impact of oral exposure and human hematological effects.

No data is available on impact of ingestion of benzene on animal or human immune system.

Pharmacokinetics

The toxicity of benzene has been attributed to it metabolites (Kalf et al., 1987). Benzene is readily absorbed dermally, via inhalation and ingestion and is metabolized via the hepatic cytochrome P_{450} system. Differential species absorption and metabolism result in intoxication and detoxication of benzene to a series of phenols, glucuronide, hydroquinones, catechol, 1,2,4-benzene-triol; some of which bind covalently to RNA, DNA and protein (Medinsky, et al, 1989). A recent summary on benzene metabolism, toxicity and carcinogenesis has been published (Goldstein et al., 1989).

Genotoxicity

Benzene was examined for mutagenic activity in bacterial and mammalian cell mutagenesis assays. It is negative in the majority of Salmonella Ames assays (Shimizu, 1983) and has been reported positive in only limited instances in the mouse L5178Y lymphoma assay and the Chinese hamster V79 cell mutagenesis assays. the positive results were with metabolic activation and point mutational activity of benzene is inconclusive (Garner, 1985).

Benzene treatment induces chromosomal aberrations and aneuploidy in cultured human lymphocytes and CHO cells (Howard et al, 1985; Danford, 1985). SCE potency for benzene metabolites ranged from catechol > 1,4-benzoquinone > hydroquinone > 1,2,4-benzenetriol > phenol > benzene in the human lymphocyte assay (Erexson et al., 1985). In vivo benzene induces dose-dependent increase in peripheral blood micronuclei in B6C3F1 mice (Choy et al., 1985). In humans, chromosomal aberrations were noted in workers inhaling up to 12 ppm benzene for up to 18 years in an aged, sex, smoking-habits, site of residence matched control study (Sarto et al., 1984).

Carcinogenicity

Etiological association between benzene and leukemia was suggested by several epidemiological studies involving occupational exposure to benzene in various manufacturing industries. Retrospective cohort mortality studies of male rubber products workers indicated a significant increase in leukemia compared to the general U.S. population (Infante et al., 1977). In a follow up study, Rinsky et al. (1987) found elevated risk to benzene inhalation exposure at doses of 40 ppm-years up to greater than 400 ppm-years; a clear dose-response human study.

Benzene induces tumors in rodents via inhalation and gavage and shows a clear dose-response from 50 to 500 mg/kg in rats (Maltoni et al., 1983). In the NTP bioassay (NTP, 1986) both rats and mice developed multiple tumors in various organs and sites (Zymbal gland, oral cavity, lymphoma, lung tumors and male had increased incidence of harderian gland and preputial gland tumors while females had increased incidence of mammary gland and ovarian tumors). Based on the above data and numerous other reports (Goldstein et al., 1989), benzene is classified as a class A carcinogen with an oral and inhalation potency factor of 2.9 E-02 $(mg/kg/day)^{-1}$. The risk to humans was calculated to be about 5 times less than for animals based on pharmacokinetic parameters. A drinking water unit risk of 8.3E-07 μg/L was set but the RfD is pending (IRIS, 1990). The State of California has recently set the drinking water standard at 1.0 μg/L.

CARBON TETRACHLORIDE

Carbon tetrachloride is a colorless, heavy liquid with an aromatic,sweet odor. It readily volatilizes and therefore is rarely found as a liquid in the environment. Most environmental carbon tetrachloride is in a gaseous state or in small quantities dissolved in water. Historically carbon tetrachloride has been used for a variety of purposes. This man-made compound has been used in the production of refrigerants and propellants of aerosol cans. It was also used as a common industrial solvent and degreaser until the mid-1960s. Carbon tetrachloride was used as a dry-cleaning agent and fire¬extinguisher due to its non-flammability. The toxic potential of carbon tetrachloride was realized and its use discontinued thereafter. However once carbon tetrachloride is introduced into the environment, it can take between 30 and 100 years to be broken down. Carbon tetrachloride is therefore considered to be very persistent in the environment (Sittig, 1985; ATSDR, 1990).

ACUTE EFFECTS

Inhalation

Most human data regarding acute inhalation exposure of carbon tetrachloride is drawn from case studies of people following accidental spills, use of the compound as a cleaning agent or fire extinguisher. Exposure concentrations are therefore seldom quantified. One commonly encountered characteristic of carbon tetrachloride sensitivity in humans is an associated tendency for alcoholism (Smyth, 1935; Umiker and Pearce, 1953).

Once case study of an alcoholic worker estimated to have been exposed to 250 ppm of carbon tetrachloride for 15 minutes produced death whereas non-alcoholic workers were exposed for 4 hours with only a slight headache (Norwood et al, 1950; Umiker and Pearce,1953).

In animals, the lethal potential of carbon tetrachloride is dependent on both concentration and duration of exposure. An eight-hour LC50 value for mice is reported to be 9,500 ppm (Svirbely et al, 1947) whereas 50 percent mortality is reported after 4 to 6 hours of exposure to 7,300 ppm in rats.

Ingestion

Typically oral exposure to carbon tetrachloride results from an intentional and monitored consumption for the treatment of hookworm, accidental ingestion, or suicide attempts. The medical treatment of hookworm generally ranges between 3 to 5 ml (5 to 8 g), whereas suicide attempts are of 300 g or more. More accidents and suicides occurred prior to 1960 when the widespread use of carbon tetrachloride as an anthelminthic and cleaning fluid ceased. Again the most extreme reactions to carbon tetrachloride followed the consumption of alcohol (ATSDR, 1990).

Death from the ingestion occurs in humans within hours to days of exposure. The most common clinical effects producing death are severe liver and/or kidney damage. Other symptoms include cardiovascular, central nervous system effects and gastrointestinal irrigation (Guild et al, 1958; von Oettingen, 1964).

Carbon Tetrachloride

Concentrations reported to cause death in humans following oral exposure range from a slow as 1.5 ml (40 mg/kg) in alcoholics up to 10 ml (200 mg/kg) with some suicide victims ingesting as much as 150 ml of carbon tetrachloride (Umiker and Pearce, 1953; von Oettingen, 1964; Lamson et al, 1928; Phelps and Hu, 1924).

Studies in rodents have reported LD50s ranging from 6,000 to 24,000 mg/kg (McLean and·21 ╔H·McLean, 1966; Pound et al, 1973; Hayes et al, 1986). Other studies have reported deaths in cats and rats at concentrations of 400 to 800 mg/kg (Chandler and Chopra, 1926; Hayeset al, 1986). The primary cause of death in animals, as in humans, is central nervous system depression and liver and kidney toxicity.

Dermal

Most human data regarding dermal exposure to carbon tetrachloride also involves inhalation exposure with very limited quantification for exposure concentrations precluding any estimation of an acutely lethal dermal dose.

Studies in animals report mortality within 5 days of 25 percent of all guinea pigs exposed to 260 mg/cm3 of carbon tetrachloride applied to the skin and 65 percent mortality at 1,000 mg/cm3 (Wahlberg and Boman, 1979). Another study reported the LD50 of dermal exposure in guinea pigs and rabbits to be greater than 15,000 mg/kg (Roudabush et al,1965).

SYSTEMIC EFFECTS

Respiratory Effects, Inhalation

Severe respiratory effects such as edema, hemorrhage and congestion usually do not appear until six to eight days after exposure. Pulmonary edema is found commonly in humans but is not considered the primary cause when death occurs (Umiker and Pearce, 1953).

In animals, the pulmonary effects of carbon tetrachloride appears to be less pronounced. Adams et al (1952) reported no observation of respiratory toxicity in rats exposed to concentrations up to 3,000 ppm and higher. The same study exposed rats and monkeys to 100 ppm for 200 days again with no report of lung injury.

Ingestion

Oral exposure in humans to carbon tetrachloride results in similar effects as following inhalation exposure. Umiker and Pearce (1953) also evaluated case reports of deaths resulting from oral exposure and found pulmonary edema and hemorrhage appearing eight days after exposure but still considered it secondary to other possible causes of mortality.

Respiratory effects in animals resulting from ingestion seem more prominent than those observed from inhalation of carbon tetrachloride. Dose-response effects such as pulmonary epithelial damage as concentrations as low as 160 mg/kg (Hollinger, 1982). Pulmonary

edema and hemorrhage as well as subcellular changes occurred at reported concentrations up to 4,000 mg/kg (Gould and Smuckler, 1971; Boyd et al, 1980; Hollinger, 12982).

Dermal

No studies found.

Cardiovascular Effects, Inhalation·

Exposure via inhalation to carbon tetrachloride produced no significant cardiovascular effects, even at concentrations which produce liver and/or kidney toxicity (Adams et al,1952; Prendergast et al, 1967; Smyth et al, 1936; Stewart et al, 1961; Umiker and Pearce,1953). A few studies reported slight changes in blood pressure and heart rate which again were considered secondary to renal and kidney effects (Ashe and Sailer, 1942; Guild et al,1958; Kittleson and Borden, 1956).

Ingestion

The little data available regarding oral exposure to carbon tetrachloride in humans and animals indicates little potential for cardiovascular effects. No major histopathological changes of the heart were reported even at concentrations that produce hepatic and renal effects (Gardner et al, 1925; Leach, 1922; MacMahon and Weiss, 1929; Korsrud et al,1972).

Dermal

No studies found.

Gastrointestinal Effects, Inhalation

Gastrointestinal effects such as vomiting, nausea and pain are commonly the initial signs of acute exposure (Stewart and Witts, 1944; Guild et al, 1958; Norwood et al, 1950). Gastrointestinal effects are also commonly associated with longer-term exposure also(Elkin, 1942; Smyth et al, 1936). It is thought that any gastrointestinal effects are secondary to autonomic nervous system effects (Stewart and Witts, 1944).

Ingestion£

Traditionally, carbon tetrachloride was used for treatment of hookworms at doses of 3 to 5ml (70 to 110 mg/kg). Exposure at these levels produced only mild gastrointestinal effects(Hall, 1921; Leach, 1922). Ingestion of 30 to 40 ml (600-900 mg/kg) produces nausea,vomiting and abdominal pain (Hardin, 1954; von Oettingen, 1964; Smetana, 1935; Umiker and Pearce, 1953). These effects are considered to possibly be a secondary result of central nervous system effects rather than a direct gastrointestinal effect (ATSDR, 1990).

Dermal

No studies found.

Hematological Effects, Inhalation

The hematological system is not considered to be a target system of exposure through inhalation of carbon tetrachloride. The only associated symptoms are a slight increase in white cell count or mild anemia in some cases (Gray, 1947). Other researchers observe no significant hematological effects in humans (Heimann and Ford, 1941; Norwood et al,1950; Smyth et al, 1936).

No study reported hematological effects following inhalation exposure in rats, mice or guinea pigs. Concentrations of exposure were reported to be up to 200 ppm for 170 days(Adams et al, 1952; Prendergast et al, 1967; Smyth et al, 1936).

Ingestion

Studies regarding oral exposure to carbon tetrachloride in human and animals report no association between exposure and hematological changes. Some hemorrhage and anemia was observed but attributed to other primary causes (Guild et al, 1958; Stewart et al, 1963;Hayes et al, 1986).

Dermal

No studies found.

Hepatic Effects, Inhalation

Carbon tetrachloride has been identified as a compound with market hepatic toxicity. Some of the most common signs and symptoms of carbon tetrachloride poisoning are tender and swollen liver, jaundice, increased levels hepatic enzymes and serum bilirubin and decreased levels of liver protein serum (Ashe and Sailer, 1942; McGuire, 1932; New et al, 1962;Norwood et al, 1950; Straus, 1954).

There is only limited specific and quantified data of hepatic damage in humans, however a study by Stewart et al (1961) exposed volunteers to 50 ppm for 70 minutes or 10 pm for three hours. Fifty (50) ppm is considered the lowest observed adverse effect level (LOAEL) based on changes in serum enzymes and iron. Studies monitoring workers exposed to 10 to 100 ppm for up to years were observed to have elevations in serumbilirubin levels (Smyth et al, 1936). Workers exposed to concentrations up to 200 ppm exhibited the same effects indicating slight liver damage (Barnes and Jones, 1967).

Animal data supports the potential hepatic toxicity of carbon tetrachloride. Signs of hepatic effects are parallel to those found in humans. Exposure of rats to 10 to 50 ppm results in signs of moderate to mild hepatic toxicity on both short and long-term exposures (Adams et al 1952; Paustenbach et al, 1986 a,b; Smyth et al, 1936). Monkeys seem to be less sensitive while guinea pigs seem more sensitive than rats (Adams et al, 1952; Prendergastet al 1967).

Ingestion

Signs and symptoms of hepatic injury resulting from ingestion of carbon tetrachloride are the same as those characteristic of inhalation exposure. Concentrations sufficient to produce mortality usually do so within 15 days after exposure. Upon autopsy findings include marked accumulation of fat and necrosis typically the centrilobular region (Umiker and Pearce, 1953; Jennings, 1955).

The U.S. Environmental Protection Service, Integrated Risk Information System (IRIS)reports an oral reference dose (RfD) of 7 E-4 mg/kg/day for liver lesions based on a no observed adverse effect level (NOAEL) of 1 mg/kg/day (standardized to 0.71 mg/kg/day)reported by Bruckner et al (1986). The researchers exposed rats to 0 to 33 mg/kg/day carbon tetrachloride orally for 5 days/week for 12 weeks. Significant increases in serum activity and increase in liver lesions was observed at exposure concentrations at 10 mg/kg and above.

The results of the work by Bruckner et al (1986) are supported by other studies by Alumotet al (1976) and Hayes et al (1986) which reported signs of mild hepatic toxicity at concentrations of 12 to 40 mg/kg/day for 35 to 90 days in mice and rats. There appeared to be a dose-response relationship with severity of hepatic injury increasing with dosing levels. Most researchers agreed that the kidney seemed to be the most sensitive organ.

Dermal

No quantified concentration of dermal exposure to carbon tetrachloride were found. However, Perez et al (1987) and Kroneri et al (1979) noted an apparent association between dermal exposure and the development of slight liver and/or kidney toxicity amongother more non specific systemic effects. No definite conclusions can be drawn due to limited number of cases cited and no quantified data.

Renal Effects, Inhalation

In conjunction with the characteristic hepatic effects, renal toxicity due to carbontetrachloride exposure is common, especially in humans more so than animals. Clinical signs of toxicity include nephritis, nephrosis, edema, proteinuria, and mild degeneration of the kidney tissue (McGuire, 1932; Norwood et al, 1950; Smetana, 1939; Guild et al, 1958;Ashe and Sailer, 1942). The specific mechanism of toxic effect is not known.

Very little quantitative human data is available and therefore has precluded a definite set exposure level. Some concentration estimations of occupational exposure have been reported. An approximate concentration of 200 ppm was associated with an increase in proteinuria in workers (Barnes and Jones, 1967), whereas 50 ppm for 70 minutes and 10 ppm for three hours cause no urinary changes.

Animals seem slightly less sensitive with no evidence of renal toxicity apparent at exposure in rats, cats, monkeys, or guinea pigs of up to 200 ppm for 90 days (Adams et al, 1952; Bogers et al, 1987; Prendergast et al, 1967).

Ingestion

Renal failure is thought to be a contributing factor in some fatal cases of poisoning but is not considered to be the cause of death. Signs are parallel to those observed in inhalation exposure with development delayed up to six days after exposure. Most cases not proven to be fatal are reversible (Smetana, 1939; Umiker and Pearce, 1953; Gosselin et al, 1976;von Oettingen, 1964).

Animals again are less sensitive than humans with exposures of up to 4,000 mg/kg returning to normal within 5 days (Striker et al, 1968). Some concentrations which produced clear hepatoxicity resulted in only mild renal effects (Hayes et al, 1986).

Dermal

Dermal exposure is thought to act in a similar fashion has hepatic toxicity and likewise is not considered a primary route of exposure for kidney toxicity.

Neurological Effects, Inhalation

Carbon tetrachloride is a volatile halocarbon and, as such produces central nervous system depression. It was used as an anesthetic at one time before other compounds proved more efficacious and less toxic. Common signs vary with exposure concentration and include weakness, lethargy, headaches, blurred vision, and some degeneration of the brain(Hardin, 1954; Cohen, 1957; Stevens and Forster, 1953; Smyth et al, 1936; Ashe and Sailer, 1942). Some studies report headache and giddiness in workers exposed to 20-125 ppm for 8 hr/day (Elkins, 1942; Kazantzis and Bomford, 1960). it is suggested that a threshold for 8 hour exposure to carbon tetrachloride is 20 ppm.

Rats exposed to 4,000 ppm experienced ataxia and to 12,000 ppm experienced unconsciousness and death at 19,000 (Adams et al, 1952). Smyth et al, 1936 reported no observed effects in animals exposed to 400 ppm for more than 10 months.

Ingestion

Symptoms following ingestion usually are slightly delayed but result in depression of the central nervous system. Characteristic signs are similar to that observed via inhalation and have been reported to occur after single doses of five to several hundred ml (Stevens and Forster, 1953; Cohen, 1957). Recovery again is considered reversible.

Dermal

No conclusive studies found.

DEVELOPMENTAL EFFECTS

No information on human via any route of exposure is available. However animal studies indicate that does sufficient to produce maternal toxicity do not produce marked

developmental effects. Concentrations reported are up to 1,000 ppm (inhalation) and 1,400 mg/kg/day (ingestion) (Wilson, 1954; Schwetz et al, 1974).

REPRODUCTIVE EFFECTS

Inhalation

No human data is available. However the few animal data indicate the potential for a decrease in fertility in rats at 200 ppm and greater (Smyth et al, 1936; Adams et al, 1952).

Ingestion

Of the few available studies, none identified any dose-related adverse effect following oral exposure to carbon tetrachloride in rats (Alumot et al, 1976).

Dermal

No studies found.

GENOTOXIC EFFECTS

There is very little information available following exposure through either inhalation,ingestion or skin. Two studies of oral exposure found that a single dose of 100 mg/kg did not produce genotoxic effects (Mirsalis and Butterworth, 1980).

Another study with similar exposure concentrations found an increase in DNA synthesis but did not consider it adverse (Craddock and Henderson, 1978).

CARCINOGENIC EFFECTS

Carbon tetrachloride is classified by the USEPAs weight-of-evidence as B2, a probable human carcinogen. No one study was judged able to stand alone so several studies were used as a basis to calculate the oral cancer potency factor (CPF) which is reported to be 1.3E-1 mg/kg/day (ATSDR, 1989; IRIS, 1990).

Inhalation

No structure studies of inhalation exposure in either humans or animals was found. Reports have associated the incidence of liver cancer to exposure to carbon tetrachloride fumes in both short and long-term exposure durations (Tracey and Sherlock, 1968; Johnstone, 1948). IRIS (1990) reports an extrapolated CPF for inhalation to be the same as for ingestion at 1.3 E-1 mg/kg/day for the hepatic tumorigenic potential of carbontetrachloride.

Ingestion

The evidence of carcinogenic toxicity is based on the animal data derived from several studies. Again the oral CPF is 1.3 E-1 mg/kg/day primarily for hepatic carcinogenicity. The

incidence of hepatocellular carcinomas was associated with treatment and dose of carbon tetrachloride. Concentrations ranged from 0 to 94 mg/kg for 5 days/week for 78 weeks. The higher dosing groups exhibited low survival however a dose-dependent association was established (NCI, 1976 a,b; 1977). Another study reported the incidence of hepato tumors in mice exposed to concentrations as low as 20 mg/kg for 120 days(Eschenbrenner and Miller, 1946). Della Porta et al (1961) as well as Edwards et al (1942)were also used to derive the CPF. Della Porte et al (1961) exposed hamsters to 6.25 g to 12.5 l for 30 weeks with additional observation for 25 weeks. Each hamster that survived had liver cell carcinomas. Edwards et al (1942) treated a species mice traditionally resistant to carcinogenesis with 0.1 ml of a 40 percent carbon tetrachloride solution for 4 months with a least 3 months of observation following treatment. The incidence of hepatocellular carcinomas was much greater in those that were exposed than those which were not.

Dermal

No studies found.

CHLOROFORM

The main use for chloroform in industry is as an ingredient in the production of fluorocarbons. The remainder is used in a variety of ways including solvents. Numerous sources of environmental chloroform exist. Industries such as the paper and pulp bleaching plants which use chlorine or drinking water that is chlorinated generates chloroform. Chloroform is also formed in the environment through the degation of trichloroethylene.

Acute Effects of Chloroform. As with the other compounds discussed, exposure to high concentrations of chloroform can cause acute effects such as dizziness and headache. A very high exposure can result in death. The LC 50 for rats is 10,000 ppm for a 4 hour exposure (Lundberg, et at., 1986). The lethal inhalation concentration from humans is not known.

A range of value are reported for oral LD 50 levels for rats ranging from 118 mg/kg to 444 mg/kg. A lethal ingested dose for humans is 211 mg/kg (Schroeder, 1965).

Systemic Effects of Chloroform. The organs which are the target of long term chloroform exposure are the liver kidney and CNS. Animal inhalation studies have shown liver effects including necrosis in rats, rabbits and guinea pigs exposed to 25 ppm for 7 hours per day 5 days per week for 6 months (Torkelson et al., 1976).

Toxic jaundice and hepatitis has been reported in humans exposed occupationally to 2 to 205 ppm for 1 to 4 years (Bomski, et al 1967).

Carcinogenic Effects of Chloroform. Chloroform is classified by the EPA as a B2 probable human carcinogen. In humans there is insufficient data on chloroform itself to draw any conclusions. In typical exposure, the chloroform occurs with other chlorinated organics to the individual effects cannot be studied alone.

There is sufficient animal data to prove the carcinogenicity of chloroform. Eight strains of mice have been tested as well as two strains of rats and beagle dogs. A study of ingestion of chloroform in oil by rats and mice 5 times per week for 78 weeks was performed by NCI in 1976. Varying concentrations of chloroform were administered. Kidney epithelial tumors were observed in the male rats as well as significant increases in hepatocellular carcinomas in all mice. In the low dose male mice, which did not develop hepatocellular carcinoma, liver nodular hyperplasia was observed.

Chloroform was administered to rats and mice in a study by Jorgenson et al., in 1985. A significant increase in renal tumors in the rats was observed at 1,800 mg/l (160 mg/kg/day).

Ingestion of chloroform in toothpaste was not carcinogenic to mice and beagles. Another study administered 60 mg/kg/day to mice and found an increased incidence of kidney epithelial tumors (Roe et al 1979).

CHLOROBENZENE

Chlorobenzene is a colorless liquid that has a mild aromatic odor. it is @@ also known as phenyl chloride, monochlorobenzene and chlorobenzol. Chlorobenzene is used in the manufacture of other compounds such as aniline, phenol, chloronitrobenzene and pesticides as well as an intermediate in the production of dyestuffs. (Sittig) Chlorobenzene has been detected in the finished water of several water supply systems at concentrations ranging from 4.7 μg/6 to 5.6 μg/6. The compound may be produced as a result of chlorination during water treatment. (EPA, 1975a)

Acute Effects

Chlorobenzene is not considered an extremely acute toxin. Rozenbaum (1947) reported an LC50 in mice of 20 μg/L (4,300 ppm) after exposure through inhalation. Another study reported the death of all animals (cats)2 hours after exposure to 8,000 ppm and 7 hours after exposure to 3,700 ppm (Irish, 1963).

No studies regarding inhalation, dermal or oral exposure in humans were located.

Animals study of oral exposure to chlorobenzene report lethality in rats after one exposure to 4,000 mg/kg and 1,000 mg/kg in mice. The same study exposed rats to 1,000 mg/kg/day for 14 days and also observed lethality. Decreased survival was also observed in rats after intermediate exposure to 500 mg/kg/day and in mice at 250 mg/kg/day.

It is also reported that chronic oral exposure to chlorobenzene at 120 mg/kg lowers survival significantly with no compound-induced toxic lesions identified as responsible for the reduced survival.

Systemic Effects

Human data on the effects of chlorobenzene on various organ systems is limited via all routes of exposure. Available animal data is presented.

Hematological. A limited number of studies in animals suggest that chlorobenzene may cause hematological changes. Dilley (1977) observed some dose and time related effects in rats. The primary affect was increased reticulocyte count at exposure concentrations >75 ppm for 24 weeks.

In another more inconclusive study, Zub (1978) reported slight leukopenia and lymphocytosis in mice exposed to 0.1 mg/l chlorobenzene for 3 months. Hematological affects have not been duplicated in other species and are considered insensitive indicators of chlorobenzene toxicity.

Hepatic. The study previously cited by Dilley (1977) reported observation of liver congestion in male rats and male rabbits after exposure to >75 ppm chlorobenzene for 24) weeks. Inhalation of 150 and 450 ppm chlorobenzene is reported to have produced increased liver weights and liver hypertrophy in male rats. (Nair et al., 1987).

Experimental evidence in animals suggest that human exposure to chlorobenzene via inhalation may potentially produce liver toxicity.

Liver effects in animals has also been reported after oral exposure. Effects include increased serum enzymes, altered liver weights, necrosis, degeneration and porphyrin metabolism interference. Doses which cause toxic effects have been observed at 1,140 mg/kg/day for exposure of 5 days or less (Remington and Ziegler 1963) and at 100 and 125 mg/kg/day for longer term exposures in rats and mice (Hazleton, 1967; NTP, 1985). Theno observed effects level is considered to be 60 mg/kg/day and is used as the basis for the derivation of an intermediate oral MRL of 0.4 mg/kg/day.

Renal. Based on a small number of studies in animals, chlorobenzene demonstrates kidney toxicity. Effects are observed at concentration levels similar to those found in the liver toxicity of the compound. The inhalation studies conducted by Nair et al (1977) and Dilley (1977) as cited above reported adverse kidney effects that are considered treatment¬related at concentrations of 75 to 450 ppm.

Toxic effects to the kidney after oral exposure were observed at concentrations >1,005 mg/kg/day (Hazelton 1967) and at >250 mg/kg (NTP 1985). Again, chlorobenzene seems to produce kidney effects at comparable concentrations found to produce liver effects. The compound is therefore considered a potential area of concern in human exposure and the subsequent development of kidney effects.

Immunological Effects. Only one study of oral exposure to chlorobenzene in animals regarding immunological effects was available. The study showed necrosis of the thymusand lymphoid or myeloid depletion of bone marrow, spleen, and thymus at exposure of >250 mg/kg/day for 13 weeks. However, there were no immune function test conducted and therefore no NOAEL established. A LOAEL of 250 mg/kg/day was noted. (NTP1985)

No substantial assumptions or conclusions can be made regarding the immunotoxic effects of chlorobenzene in humans based on the limited animal data.

Neurological Effects. Human inhalation exposure to unspecified quantities of chlorobenzene have produce central nervous system effects. Intermittent occupational exposure for up to 2 years has produced numbness, cyanosis, hyperesthesia and muscle spasms. Results provide only qualitative evidence of the neurotoxicity of chlorobenzene in humans. (Rozenbaum 1947)

Some qualitative data regarding urotoxicity in animals is provide by the study in cats by Irish (1963). Findings include narcosis at inhalation of 5.5 mg/L (1,200 ppm) and 37 mg/L(8,000 ppm). Other more general central nervous system effects were observed also at 1 to 3 mg/L (2,400 to 2,900 ppm). Concentrations of 1 to 3 mg/L (220 to 660 ppm) produced no significant neurological effects.

Only one case study of oral exposure to chlorobenzene constitutes the available data regarding neurotoxicity following oral exposure in humans. A two year old male ingested 5 to 10 cc of solution used for removing stains which was largely made of chlorobenzene. The odor of chlorobenzene was evident in the child's urine and exhaled air. Adverse effects included

unconsciousness, non-response to stimuli, muscle spasms, and cyanosis. The child did undergo a full recovery. (Reich, 1934)

Because of the paucity of dose-response data either animal or human, no quantitative determination of the effects of chlorobenzene on the central nervous system is available.

Developmental and Reproductive Effects. Little data exist on the developmental and/or reproductive toxicity potential of chlorobenzene. A study by John et al (1989) reported no structural malformations at inhalation exposure in rats and rabbits concentrations of up to 590 ppm. Nair et al (1987) reported no adverse effects on reproductive performance or fertility.

The available data does not allow for any prediction of the developmental or reproductive effects of chlorobenzene in humans. However the data does suggest that it may not be an area of prime concern in human exposure.

Carcinogenic Effects

The present data is inadequate to characterize the carcinogenic potential of chlorobenzene in humans. In a chronic bioassay in rats and mice produce inconclusive results in dose concentrations of up to 120 mg/kg/day. There was reported a significant increase inneo plastic modules of the liver in male rats which where not observed in female rats or maleor female mice. Nodules have historically been characterized by a progression to carcinomas. However, the existing data cannot be interpreted as a certain indication of the carcinogenic potential of chlorobenzene in humans.

Environmental Effects

There have been no studies that demonstrate relationship between environmental levels of chlorobenzene and the development of adverse health effects in humans. Ambient air concentrations have been found to range from 60 to 300 ng/m3. (Barkley et al 1980) Concentrations in drinking water range from 10 to 60 mg/L (Barkley et al 1980) and from 4.7 mg/L to 5.6 mg/L. (EPA 1975)

Air is an important, if not the most important, medium for the transport of chlorobenzene due to its high volatility and low water solubility. Biodegradation is rapid with no residues detected after 1 or 2 weeks in soil (Tabak et al 1981). Bio accumulation is considered moderate due to its liquid solubility.

Occupational workers are probably at highest risk for exposure due to its volatility and extensive use as a solvent in industry. The concentration in the work place has been reported to be as high as 6,000 times the mean urban air level. (Brodzinsky and Singh 1983).

Barkley et al (1980) found levels in blood ranging from 0.05 to 17 ng/L and in urine ranging from 25 to 120 μg/L in residents living near a former toxic chemical dump.

No studies found any demonstrated relationship between levels found in humans and any adverse biological effect.

1,2- and 1,3-DICHLOROBENZENES

The dichlorobenzenes are halogenated aromatic hydrocarbons with the molecular formula C6H4C2 and a molecular weight of 147.01. Three isomers are known to exist: ortho-dichlorobenzene (1,2-dichlorobenzene, DCB), meta-dichlorobenzene (1,3-dichlorobenzene, m-DCB) and para-dichlorobenzene (1,4-dichlorobenzene -DCB) (U.S. EPA, 1980). All three compounds have low water solubilities but are nonetheless toxic to aquatic organisms. They are readily soluble in fats and fat-soluble substances (U.S. EPA, 1980).

Ortho-dichlorobenzene, a clear liquid, is available in the United States as a technical grade containing 98.7% by weight of the ortho isomer, with the remaining 1.3% consisting of the meta and para isomers combined. It is also available in a grade containing 83% of the ortho isomer and 17% of the meta and para isomers (IARC, 1974). It is produced commercially by the direct chlorination of benzene in the liquid phase in the presence of a catalyst, usually ferric chloride, and fractionation of the resulting mixture of chlorinated benzenes. Total U.S. production in 1979 was 26 million kg; an undisclosed amount of a mixture of ortho- and para-dichlorobenzenes was produced (IARC, 1982).

Seventy percent of the o-DCB produced in 1978 was used in the synthesis of 3,4-dichloroaniline, a key intermediate in the production of herbicides (propanol, diuron and linuron). Another fifteen percent was used in the production of toluene disocyanates, important raw materials in the manufacture of such products as flexible foams. Ortho-dichlorobenzene is also used as a solvent in paints, paint-and grease-removing formulations and rust preventatives, and is also used in the manufacture of dyes (IARC,1982).

Little information is available concerning the production and use of meta-dichlorobenzene, also a liquid. It may occur as a contaminant of o-DCB and p-DCB formulations (U.S.EPA, 1980). Production estimates for 1977 were reported to be 0.2-2.0 x 106 pounds; its major uses are as a fumigant and as an insecticide (U.S. EPA, 1985).

Para-dichlorobenzene, a white solid, is produced commercially by the same method used in the manufacture of o-DCB. Production in the U.S. in 1979 amounted to 37.9 million kg. Para-dichlorobenzene is used primarily as a space deodorant, blocks with and without perfume being used in toilets and refuse containers. Fifty-five percent of the p-DCB produced in 1978 was used in this manner. Thirty-five percent was used in moth repellents. it also can be used as a mildew and fungus control agent, an animal repellant,and as a chemical intermediate for dyes, insecticides, pharamceuticals and other organic chemicals (IARC, 1982).

An estimated 5-10% of the annual U.S. production of o-DCB and an estimated 70-90% of the annual production of o-DCB have been reported to be released into the air (Johnston et al., 1979). Metadichlorobenzene has also been detected in the atmosphere (Brodzinsky and Singh, 1982). All three isomers have also been detected in raw and finished drinking water (Shackelford and Keith, 1976; U.S. EPA, 1985). Residues have been found in fish and other aquatic organisms, beef, pork and eggs, and in human fat, blood, breath and urine (IARC, 1982; U.S. EPA, 1985).

Because of their low water solubility and high fat solubility, dichlorobenzene easily penetrate most biological membranes by diffusion, including the lung and gastrointestinal tract epithelia, the brain, the liver, the renal tubules, the placenta and the skin (Ware and West, 1977; U.S. EPA, 1985). Studies have shown that within 4-12 hours of exposure,peak concentrations are reached in all tissues. Distribution, following single-dose or multiple exposures, is primarily to adipose tissue, and to lung and kidney tissues more than to liver, muscle and plasm.

Acute Effects

Riedel (1941) applied o-DCB for 15 minutes to the skin of human volunteers. A burning sensation was produced, which intensified with continued exposure up to one hour and subsided when the compound was removed. However, hyperemia and blisters later developed at the site of application, followed by a brown pigmentation of the skin that lasted for up to three months (Hollingsworth et al., 1958).

Hollingsworth et al. (1958) have stated that at the air concentration of o-DCB detected by the average individual (300 mg/M3, or 50 ppm), eye and nose irritation do not occur. The ACGIH (1986) however, has indicted that a ceiling limit of 300 mg/M3 would protect against serious but not all eye and nose irritation. Elkins (1959) reported that irritation but no other effects occur at air concentrations nearing 600 mg/M3.

The taste and odor thresholds for o-DCB in water were reported by Varshavskaya (1967a)to be 0.002 and 0.0001 mg/L, respectively.

Hollingsworth et al (1956) surveyed workers in o-DCB production facilities. Reported. results included detection of a faint odor at 90-180 mg/m3, detection of a strong odor at 180-360 mg/M3, painful eye/nose irritation at 480-960 mg/m3 and intolerable irritation at >960 mg/m3. Workers had complained of eye and nose irritation at concentrations of 800-1020 mg/m3 and had not complained at concentrations of 90-510 mg/M3.

The authors indicated that solid o-DCB caused significant irritation of intact skin only after prolonged contact, which produces a burning sensation. Warm fumes or strong solutions may also irritate skin with repeated or prolonged contact. In general, however, o-DCB is not considered a significant hazard from skin irritation or skin absorption unless exposures are unusually severe or prolonged.

A three-year-old male developed acute hemolytic anemia after ingesting de-mothing crystals(o-DCB) (Hallowell, 1959). Symptoms included listlessness, jaundice, oliguria, methemoglobinuria and other urine abnormalities, anemia, and hypothermia.

Ten guinea pigs were intubated and given single oral doses (800 mg/kg) of o-DCB (50% in olive oil). The only effect observed was a loss of body weight. However, single oral doses of 2000 mg/kg were fatal to all animals (Hollingsworth et al., 1958). Two drops of undiluted o-DCB in rabbits' eyes resulted in pain and conjunctival irritation which cleared within a week (Holingsworth et al., 1958).

Varshavaskaya (1967a) reported LD50 values for o-DCB in four animal species dosed by stomach tube: white mice 2,000 mg/kg; white rats 2,128 mg/kg; rabbits 1,875 mg/kg;guinea pigs 3,375 mg/kg. Acute poisoning was manifested similarly in all species. The animals exhibited increased lacrimation and salivation, excitation, ataxia, paraparesis,paraplegia and dyspnea. Histologic examination revealed vascular and necrotic changes in the liver, stomach mucosa and kidneys and edema of the brain.

Oral LD_{50} values for o-DCB were also reported by Varshavskaya (1967a): white mice 3,220 mg/kg; white rats 2,152 mg/kg; rabbits 2,812 mg/kg; guinea pigs 7,593 mg/kg. These LD50 values were higher than those for 0-DCB, indicating that o-DCB is more toxic for these same species. The symptoms of poisoning, however, were similar for the two compounds.

Groups of male rats were given o-DCB in olive oil five days/week for four weeks at dosage levels of 10,000 and 5,000 mg/kg. At the highest dose level there was marked cloudy selling and necrosis in the central areas of the liver lobules and marked cloudy swelling of the renal tubular epithelium with cast formation. At the lower dosage levels there was no evidence of any adverse effects (Hollingsworth et al., 1956).

Reid and Krishia (1973) found that o-DCB binds to liver protein more strongly than does p-DCB upon intraperitoneal administration of 0.5 mmol/kg. Hepatic toxicity was attributed to reactive intermediates (area oxides) produced by the binding and metabolism and was enhanced by pretreatment with phenobarbital. Para-DCB is therefore considered less toxic to the liver.

Meta-dichlorobenzene when given orally at 800 mg/kg produces a biphasic excretion of coproporphyrin. The authors believed that m-DCB stimulates its own metabolisms in the observation of this effect. The same pattern of excretion was observed in 2,4-dichlorophenol (m-DCB metabolite) and p-DCB at 900 mg/kg/day. (Poland et al., 1971)

Results also indicated that the induction of hepatic microsomal enzymes is due to the activity of methyl sulfone metabolites rather than the m-DCB. In an earlier study, Kimura et al(1985) also demonstrated that 3,5-dichlorophenyl methyl sulfone is a major contributing factor in the inducing activity of m-DCB

Systemic Toxicity

A number of clinical cases of chronic dichlorobenzene poisoning have been reported in the literature. Most of these cases involved exposure primarily to o-DCB and the remainder primarily to o-DCB; in the other cases mixtures of dichlorobenzenes including m-DCB were involved. In the majority of instances exposure was by inhalation and occurred in the workplace.

Chronic exposure to o-DCB has reportedly caused severe acute hemolytic anemia (Gadrat et al., 1962). A 47-year-old male chronically exposed dermally in the workplace to a mixture containing o-DCB developed contact eczematoid dermatitis on his hands, arms and face(Downing, 1939).

Hollingsworth et al. (1958) reported on the analysis of 40 samples of workroom air in an area where o-DCB was manufactured. Concentrations ranged from 6-264 mg/M^3 and averaged 90 mg/M3. Periodic physical examinations of the workers, including hemograms and urinalyses, revealed no adverse effects which could be attributed to o-DCB exposure.

Chronic exposure to o-DCB or to mixtures containing mostly o-DCB has reportedly caused blood disorders (anemia, primarily) and liver damage (Sumers et al., 1952; Cotter, 1953;Petit and Champeix, 1948; Perrin, 1941; Ware and West, 1977). A case of pulmonary granulocytosis was reported by Weller and Crellin (1953) in a 53-year-old female exposed in her home for 12-15 years to a moth eradicator product. A 19-year-old female who ingested (pica) four to five month pellets daily for two and on-half years developed increased skin pigmentation in areas 3 to 7 cm in diameter on her limbs, mental sluggishness and tremor. Upon withdrawal she had an unsteady gait along with decreased pigmentation (Frank and Cohen, 1961).

In their report on surveys of o-DCB exposure in plants, Hollingsworth et at. (1956) stated that periodic health examinations of the workers detected no adverse effects that were attributable to the exposure. Repeated exposure may lead to tolerance or acclimation,however, so sensory warnings may eventually be less protective in chronically-exposed individuals. After reviewing considerable human data, the authors stated they did not believe that chronic exposure to o-DCB caused cataracts.

Hollingsworth et al., (1958) investigated the toxicity of o-DCB in several species by several routes of exposure. Groups of rats, guinea pigs, rabbits and monkeys were exposed to o-DCB vapor seven hours/day, five days/week, for six or seven months at an average concentration of 560 mg/M^3. No effect was noted in any of the animals on gross appearance, behavior, growth, organ weights, urinalysis, blood urea nitrogen, mortality, or gross or microscopic appearance of tissues. Hematological studies in the rabbits and monkeys were normal. In another inhalation study, the authors exposed rats, guinea pigs and mice to 290 mg/M3 for seven hours/day, five days/week for six and one-half months. Again, no adverse effects were noted.

Hollingsworth et al., (1958) also dosed groups of white rats by stomach tube with o-DCB in olive oil emulsified with acacia. The animals were dosed five days/week for a total of 138 doses in 192 days at dose levels of 18.8, and 386 mg/kg. No adverse effects were seen at the low-dose level. At 188 mg/kg, liver and kidney weights were increased slightly. At the highest dose level there was an increase in liver and kidney weights, decreased spleen weight, and slight to moderate cloudy swelling on microscopic examination of the liver.

Varshavaskaya (1967a) dosed rats orally with 0.001, 0.01, and 0.1 mg/kg of o-DCB for five months. The lowest dose (0.001 mg/kg) showed no hemopoietic or enzymatic effects. The 0.01 mg/kg dosing group exhibited some hemopoietic effects that were more pronounced at 0.1 mg/kg. The highest dosing level also produced liver, kidney, and enzymatic effects.

Hollingsworth et al. (1956) exposed rats and guinea pigs through inhalations to an average p-DCB concentration of 341 ppm seven hours/day, five days/week for six months. Observations included slight histological changes of the liver and increased liver and kidney

weights. Exposure to 96 ppm seven hours/day, five days/week for six months in the same species produced no observed adverse effects.

Groups of female rats were fed p-DCB in olive oil by gavage five days/week at dosage levels of 18.8, 188 or 376 mg/kg for a total of 138 doses in 192 days. At the highest dosage level there was moderate increase in the average weight of the liver; microscopic examination revealed slight cirrhosis and focal necrosis. There was also a slight increase in the average weight of the kidneys. At the 188 mg/kg level there was a slight increase in the average weight of the liver and the kidneys. No adverse effects were noted at the lowest dose (Hollingsworth et al., 1956).

Rabbits were fed p-DCB in olive oil by gavage for as many as 92 doses in 219 days at a level of 1000 mg/kg or five days /week for 263 doses in 367 days at a level of 500 mg/kg. There were some deaths at the 1000 mg/kg level. At both dosage levels rabbits exhibited loss of weight, definite to marked tremors, weakness and slight liver changes. Hematological values were normal, and no cataracts were produced (Hollingsworth et al., 1956).

Groups of 76-79 rats of both sexes were exposed by inhalation to p-DCB vapor concentrations of 0, 75 or 500 ppm for five hours/day, five days/week for a total of 76 weeks. (Riley et al., 1980a). Surviving rats were left unexposed for up to 36 weeks following the exposure period. Some statistically significant changes in blood biochemistry and hematology were noted, however, the changes were not dose related. In the 500 ppm group, urinary protein and coproporphyrin output were slightly elevated and liver and kidney weights were increased, although there was no histological evidence for an effect in these organs. No other treatment-related effects were noted. The investigators considered the no-effect-level to be 75 ppm.

Groups of 75 female SPF Swiss mice were exposed to p-DCB vapor concentrations of 0 to 500 ppm for a total of 57 weeks. Surviving mice were left unexposed until the terminal kill at 75-76 weeks. Clinical conditions were recorded at regular intervals, and detailed histopathology examinations were performed on all mice which had been exposed for at least 52 weeks. No evidence of treatment-related non-neoplastic effects was noted (Riley et al., 1980b).

Teratogenic and Reproductive Effects

A study conducted by Hayes et al (1985) exposing rats and rabbits to o-DCB and p-DCB via inhalation at concentrations up to 400 ppm. Ortho-dichlorobenzene was not teratogenic or fetotoxic in either species.

Anderson and Hodge (1976) found no relation between inhalation exposure to p-DCB and male-related fertility problems. Hodge et al (1977) found no evidence of embryo toxicity, fetotoxicity or teratogenicity in rats exposed to 0-500 ppm of p-DCB by inhalation.

Giavini et al (1986) exposed rats orally to 0-100 mg/kg/day of p-DCB. Slight embryotoxic effects were observed at doses of 500 mg/kg/day and greater. The effects were considered to potentially an indirect result rather that a direct result of maternal consumption of p-DCB

due to decreased maternal food consumption at the dosing range where effects where observed.

Carcinogenic and Mutagenic Effects

Zapata-Gayon et al. (1982) examined the chromosomes of eight males and eighteen females who were accidentally exposed to vapors of o-DCB being used as a pest control for eight hours/day for four days. Karyotypes of cells from exposed subjects were compared with those of eight male and eight female controls. Most of those exposed to o-DCB experienced dizziness, headaches, fatigue, nausea and eye and nose irritation. The karyotype analysis revealed that the total number of cells having clastogenic chromosal alternations was greater in the exposed group than in the controls (8.9% vs. 2.0%, $p<0.001$). In addition, the total number of single chromosomal breaks (6.2% vs. 0.9%, $p<0.001$) and double breaks (6.4 vs. 1.6%, $p<0.01$) were different.

Fifteen of the original exposed cases were followed up six months after initial exposure. The number of altered cells and single breaks was not significantly different ($p<0.05$) from the original control frequencies, but the number of double breaks was still increased (3.7% vs. 1.6%, $p<0.01$). Polyploidy and ring formation were also noted, but the difference between exposed and control was not significantly different.

Two cases of chronic lymphoid leukemia, two cases of acute myeloblastic leukemia and one case of myeloproliferative syndrome were reported by Girard et al. (1969) as occurring after exposure to dichlorobenzenes. The chronic lymphoid leukemia developed in an individual who had been exposed to a glue containing 2% o-DCB from 1945-1961 and in an individual who had been exposed to a solvent used to clean electrical parts containing a mixture of o-DCB (80%), m-DCB (2%) and p-DCB (15%) from 1940-1950. This same cleaning solvent had been taken home from the factory and used for cleaning clothes (two liters a year for several years) by one of the subjects who subsequently developed acute myeloblastic leukemia. The other individual with acute leukemia had a history of chronic repeated dermal contact form compulsive use of a cleaning solution (containing 37% o-DCB) to clean clothes (in place).

Veljkovi'c and Lalovi'c (1977) looked at the correlation between the quasi-valence number ,or Z^*, and the known carcinogenic activity of a number of compounds. The Z^* is a parameter which takes into consideration such factors as valence electrons, atoms and elements in a compound's formula. The authors reported a strong correlation between these factors and carcinogenicity. A Z^* below 3.20 corresponded to a potential carcinogen, while a Z^* above this value corresponded to a noncarcinogen. Dichlorobenzene (isomer not specified) fell into the class of potential carcinogens with a Z^* of 2.50.

Ortho-dichlorobenzene was administered in corn oil by gavage five times/week for 103 weeks to rats and mice at doses of 60 and 120 mg/kg. There was no evidence of carcinogenicity under the conditions of the studies. Groups of 16 male mice were exposed by inhalation to p-DCB at 75, 225 or 450 ppm for six hours/day for five days. Following exposure, the males were mated with untreated virgin females each week for eight weeks. Para-dichlorobenzene was not mutagenic in this assay by various measures of early fetal death.

Positive responses were produced in three concurrent positive control groups exposed to known mutagenic chemical (Anderson and Hodge, 1976).

Anderson and Richardson (1976) exposed groups of rats by inhalation for either two hours at a concentration of 299 or 682 ppm, five hours/day for five days or at a concentration of 75 or 500 ppm for five hours/day, five days/week for three months. No significant increase in the number of chromosomal abnormalities was noted in the p-DCB exposed animals when compared to controls.

Male and female Swiss mice were treated topically three times with 0.1 ml of a solution of 104 mg dichlorobenzene/L acetone (isomer not specified). After 10 days the animals were sacrificed, and the treated skin examined for sebaceous gland atrophy and epithelial hyperplasia. These results were interpreted as indicating the dichlorobenzene tested was not carcinogenic (Guerin and Cuzin, 1961).

The toxicity experiments of Hollingsworth et al (1956, 1958) and Varshavskaya (1967b) have previously been described. No evidence of carcinogenic activity was noted in these experiments. However, since they were not designed to assess carcinogenicity, the results of these studies are inconclusive and inadequate to use in the evaluation of the cancer-causing potential of the dichlorobenzenes (U.S. EPA, 1980).

Parsons (1942) administered a single subcutaneous injection of 0.2 ml of a 0.2 percent solution of p-DCB in sesame oil to each of six irradiated mice, and four days later injected 0.2 ml of silica in suspension into the site. On the tenth day the intraperitoneally-injected mouse was sacrificed and was noted to have wide-spread sarcomatous growth throughout the peritoneum. Three irradiated mice died by the tenth day. Ten nonirradiated mice received the same p-DCB preparation subcutaneously for nine doses over two months, also receiving the silica suspension at two-week intervals. Four of these animals died within 30 days. By the 77th day, a nonirradiated survivor had developed a large sarcoma and secondary growths in the lymph glands and peritoneum.

The IARC (1987) has stated that there is "inadequate evidence" for the carcinogenicity of dichlorobenzenes to humans, while noting the series of cases reported by Girard et al.(1969) that suggested an association between exposure to dichlorobenzenes and leukemia.

The IARC (1987) has stated that there is "inadequate evidence" for the carcinogenicity of ortho-dichlorobenzene to animals. Based on the results of the recent (1987) NTP study in mice and rats, the organization has stated that there is "sufficient evidence" for the carcinogenicity of para-dichlorobenzene to animals (IARC, 1987). Therefore, o-DCB has been put in Group 3 not classiable as to carcinogenicity to humans; p-DCB has been put into group 2B possibly carcinogenic to humans (IARC, 1987). Meta-dichlorobenzene has not been evaluated for carcinogenesis by the IARC.

InVitro Studies

Carey and McDonough (1943) found evident of chromosomal abnormalities in Allium exposed to p-DCB. A study by Sharma and Bhattacharyya (1956) reported the same results

in plant tissues. Sharma and Sarkar (1957) found p-DCB caused meiotic cell abnormalities in flower buds. Srivastava (1966) and Prasad (1970) also came to the same conclusion various genera of the tribe vicieae.

Anderson's (1976) study of p-DCB exposure in various strains of Salmonella typhinurium found no dose-related mutagenic effects.

Ortho-dichlorobenzene was very weekly mutagenic in aspergillus nidulans in a 1970 study. AD study by Prasad (1970). No point mutations or mutagenic activity observed in studies by Anderson et al. (1972) or Lawler et al. (1979) in Salmonella typhimurium.

Ortho-dichlorobenzene, m-DCB and p-DCB were all nonmutagenic in the Ames test (Haworth et al., 1983). None of the three isomers induced unscheduled DNA synthesis uncultivated human lymphocytes (Perocco et al., 1983).

1,4-DICHLOROBENZENE

The dichlorobenzenes are halogenated aromatic hydrocarbons with the molecular formula $C_6H_4Cl_2$ and a molecular weight of 147.01. Three isomers are known to exist: ortho-dichlorobenzene (1,2-dichlorobenzene, o-DCB), meta-dichlorobenzene (1,3-dichlorobenzene, m-DCB) and para-dichlorobenzene (1,4-dichlorobenzene, p-DCB) (U.S. EPA, 1980). All three compounds have low water solubilities but are nonetheless toxic to aquatic organisms. They are readily soluble in fats and fat-soluble substances (U.S. EPA, 1980).

Para-dichlorobenzene, a white solid, is produced commercially by the same method used in the manufacture of o-DCB. Production in the U.S. in 1979 amounted to 37.9 million kg. Para-dichlorobenzene is used primarily as a space deodorant, blocks with and without perfume being used in toilets and refuse containers. Fifty-five percent of the p-DCB produced in 1978 was used in this manner. Thirty-five percent was used in moth repellents. It also can be used as a mildew and fungus control agent, an animal repellant,and as a chemical intermediate for dyes, insecticides, pharamceuticals and other organic chemicals (IARC, 1982).

Because of their low water solubility and high fat solubility, dichlorobenzene easily penetrate most biological membranes by diffusion, including the lung and gastrointestinal tract epithelia, the brain, the liver, the renal tubules, the placenta and the skin (Ware and West, 1977; U.S. EPA, 1985). Studies have shown that within 4-12 hours of exposure,peak concentrations are reached in all tissues. Distribution, following single-dose or multiple exposures, is primarily to adipose tissue, and to lung and kidney tissues more than to liver, muscle and plasma.

Acute Effects

Hollingsworth et al (1956) surveyed workers in p-DCB production facilities. Reported. results included detection of a faint odor at 90-180 mg/m^3, detection of a strong odor at 180-360 mg/m^3, painful eye/nose irritation at 480-960 mg/m^3 and intolerable irritation at >960 mg/m^3. Workers have complained of eye and nose irritation at concentrations of 800-1020 mg/m^3 and had not complained at concentrations of 90-510 mg/m^3.

The authors indicated that solid p-DCB caused significant irritation of intact skin only after prolonged contact, which produces a burning sensation. Warm fumes or strong solutions may also irritate skin with repeated or prolonged contact. In general, however, p-DCB is not considered a significant hazard from skin irritation or skin absorption unless exposures are unusually severe or prolonged.

Groups of male rats were given p-DCB in olive oil five days/week for four weeks at dosage levels of 10,000 and 5,000 mg/kg. At the highest dose level there was marked cloudy selling and necrosis in the central areas of the liver lobules and marked cloudy swelling of the renal tubular epithelium with cast formation. At the lower dosage levels there was no evidence of any adverse effects (Hollingsworth et al., 1956).

Reid and Krishia (1973) found that o-DCB binds to liver protein more strongly than does p-DCB upon intraperitoneal administration of 0.5 mmol/kg. Hepatic toxicity was attributed to reactive intermediates (area oxides) produced by the binding and metabolism and was enhanced by pretreatment with phenobarbital. Para-DCB is therefore considered less toxic to the liver.

Meta-dichlorobenzene when given orally at 800 mg/kg produces a biphasic excretion of coproporphyrin. The authors believed that m-DCB stimulates its own metabolism in the observation of this effect. The same pattern of excretion was observed in 2,4-dichlorophenol (a m-DCB metabolite) and p-DCB at 900 mg/kg/day. (Poland et al., 1971)

Results also indicated that the induction of hepatic microsomal enzymes is due to the activity of methyl sulfone metabolites rather than the m-DCB. In an earlier study, Kimura et al(1985) also demonstrated that 3,5-dichlorophenyl methyl sulfone is a major contributing factor in the inducing activity of m-DCB.

Systemic Toxicity

A number of clinical cases of chronic dichlorobenzene poisoning have been reported in the literature. Most of these cases involved exposure primarily to o-DCB and the remainder primarily to p-DCB; in the other cases mixtures of dichlorobenzenes including m-DCB were involved. In the majority of instances exposure was by inhalation and occurred in the workplace.

In their report on surveys of p-DCB exposure in plants, Hollingsworth et at. (1956) stated that periodic health examinations of the workers detected no adverse effects that were attributable to the exposure. Repeated exposure may lead to tolerance or acclimation,however, so sensory warnings may eventually be less protective in chronically-exposed individuals. After reviewing considerable human data, the authors stated they did not believe that chronic exposure to p-DCB caused cataracts.

Hollingsworth et al. (1956) exposed rats and guinea pigs through inhalations to an average p-DCB concentration of 341 ppm seven hours/day, five days/week for six months. Observations included slight histological changes of the liver and increased liver and kidney weights. Exposure to 96 ppm seven hours/day, five days/week for six months in the same species produced no observed adverse effects.

Groups of female rats were fed p-DCB in olive oil by gavage five days/week at dosage levels of 18.8, 188 or 376 mg/kg for a total of 138 doses in 192 days. At the highest dosage level there was moderate increase in the average weight of the liver; microscopic examination revealed slight cirrhosis and focal necrosis. There was also a slight increase in the average weight of the kidneys. At the 188 mg/kg level there was a slight increase in the average weight of the liver and the kidneys. No adverse effects were noted at the lowest dose (Hollingsworth et al., 1956).

Rabbits were fed p-DCB in olive oil by gavage for as many as 92 doses in 219 days at a level of 1000 mg/kg or five days /week for 263 doses in 367 days at a level of 500 mg/kg. There

were some deaths at the 1000 mg/kg level. At both dosage levels rabbits exhibited loss of weight, definite to marked tremors, weakness and slight liver changes. Hematological values were normal, and no cataracts were produced (Hollingsworth et al., 1956).

Groups of 76-79 rats of both sexes were exposed by inhalation to p-DCB vapor concentrations of 0, 75 or 500 ppm for five hours/day, five days/week for a total of 76 weeks. (Riley et al., 1980a). Surviving rats were left unexposed for up to 36 weeks following the exposure period. Some statistically significant changes in blood biochemistry and hematology were noted, however, the changes were not dose related. In the 500 ppm group, urinary protein and coproporphyrin output were slightly elevated and liver and kidney weights were increased, although there was no histological evidence for an effect in these organs. No other treatment-related effects were noted. The investigators considered the no-effect-level to be 75 ppm.

Groups of 75 female SPF Swiss mice were exposed to p-DCB vapor concentrations of 0 to 500 ppm for a total of 57 weeks. Surviving mice were left unexposed until the terminal kill at 75-76 weeks. Clinical conditions were recorded at regular intervals, and detailed histopathology examinations were performed on all mice which had been exposed for at least 52 weeks. No evidence of treatment-related non-neoplastic effects was noted (Riley et al., 1980b).

Teratogenic and Reproductive Effects

Anderson and Hodge (1976) found no relation between inhalation exposure to p-DCB and male-related fertility problems. Hodge et al (1977) found no evidence of embryo toxicity, fetotoxicity or teratogenicity in rats exposed to 0-500 ppm of p-DCB by inhalation.

Giavini et al (1986) exposed rats orally to 0-100 mg/kg/day of p-DCB. Slight embryotoxic effects were observed at doses of 500 mg/kg/day and greater. The effects were considered to potentially an indirect result rather that a direct result of maternal consumption of p-DCB due to decreased maternal food consumption at the dosing range where effects where observed.

Carcinogenic and Mutagenic Effects

Zapata-Gayon et al. (1982) examined the chromosomes of eight males and eighteen females who were accidentally exposed to vapors of o-DCB being used as a pest control for eight hours/day for four days. Karyotypes of cells from exposed subjects were compared with those of eight male and eight female controls. Most of those exposed to o-DCB experienced dizziness, headaches, fatigue, nausea and eye and nose irritation. The karyotype analysis revealed that the total number of cells having clastogenic chromosal alternations was greater in the exposed group than in the controls (8.9% vs. 2.0%, $p<0.001$). In addition, the total number of single chromosomal breaks (6.2% vs. 0.9%, $p<0.001$) and double breaks (6.4 vs. 1.6%, $p<0.01$) were different.

Fifteen of the original exposed cases were followed up six months after initial exposure. The number of altered cells and single breaks was not significantly different ($p < 0.05$) from the original control frequencies, but the number of double breaks was still increased (3.7% vs. 1.6%, $p < 0.01$). Polyploidy and ring formation were also noted, but the difference between exposed and control was not significantly different.

Two cases of chronic lymphoid leukemia, two cases of acute myeloblastic leukemia and one case of myeloproliferative syndrome were reported by Girard et al. (1969) as occurring after exposure to dichlorobenzenes. The chronic lymphoid leukemia developed in an individual who had been exposed to a glue containing 2% o-DCB from 1945-1961 and in an individual who had been exposed to a solvent used to clean electrical parts containing a mixture of o-DCB (80%), m-DCB (2%) and p-DCB (15%) from 1940-1950. This same cleaning solvent had been taken home from the factory and used for cleaning clothes (two liters a year for several years) by one of the subjects who subsequently developed acute myeloblastic leukemia. The other individual with acute leukemia had a history of chronic repeated dermal contact form compulsive use of a cleaning solution (containing 37% o-DCB) to clean clothes (in place).

Ortho-dichlorobenzene was administered in corn oil by gavage five times/week for 103 weeks to rats and mice at doses of 60 and 120 mg/kg. There was no evidence of carcinogenicity under the conditions of the studies. Groups of 16 male mice were exposed by inhalation to p-DCB at 75, 225 or 450 ppm for six hours/day for five days. Following exposure, the males were mated with untreated virgin females each week for eight weeks. Para-dichlorobenzene was not mutagenic in this assay by various measures of early fetal death. Positive responses were produced in three concurrent positive control groups exposed to known mutagenic chemical (Anderson and Hodge, 1976).

Anderson and Richardson (1976) exposed groups of rats by inhalation for either two hours at a concentration of 299 or 682 ppm, five hours/day for five days or at a concentration of 75 or 500 ppm for five hours/day, five days/week for three months. No significant increase in the number of chromosomal abnormalities was noted in the p-DCB exposed animals when compared to controls.

Male and female Swiss mice were treated topically three times with 0.1 ml of a solution of 104 mg dichlorobenzene/L acetone (isomer not specified). After 10 days the animals were sacrificed, and the treated skin examined for sebaceous gland atrophy and epithelial hyperplasia. These results were interpreted as indicating the dichlorobenzene tested was not carcinogenic (Guerin and Cuzin, 1961).

The toxicity experiments of Hollingsworth et al (1956, 1958) have previously been described. No evidence of carcinogenic activity was noted in these experiments. However, since they were not designed to assess carcinogenicity, the results of these studies are inconclusive and inadequate to use in the evaluation of the cancer-causing potential of the dichlorobenzenes (U.S. EPA, 1980).

Parsons (1942) administered a single subcutaneous injection of 0.2 ml of a 0.2 percent solution of p-DCB in sesame oil to each of six irradiated mice, and four days later injected 0.2 ml of silica in suspension into the site. On the tenth day the intraperitoneally-injected mouse was sacrificed and was noted to have wide-spread sarcomatous growth throughout the peritoneum. Three irradiated mice died by the tenth day. Ten nonirradiated mice received the same p-DCB preparation subcutaneously for nine doses over two months, also receiving the silica suspension at two-week intervals. Four of these animals died within 30 days. By the 77th day, a nonirradiated survivor had developed a large sarcoma and secondary growths in the lymph glands and peritoneum.

The IARC (1987) has stated that there is "inadequate evidence" for the carcinogenicity of dichlorobenzenes to humans, while noting the series of cases reported by Girard et al.(1969) that suggested an association between exposure to dichlorobenzenes and leukemia.

The IARC (1987) has stated that there is "inadequate evidence" for the carcinogenicity of ortho-dichlorobenzene to animals. Based on the results of the recent (1987) NTP study in mice and rats, the organization has stated that there is "sufficient evidence" for the carcinogenicity of para-dichlorobenzene to animals (IARC, 1987). Therefore, o-DCB has been put in Group 3 not classiable as to carcinogenicity to humans; p-DCB has been put into group B2 possibly carcinogenic to humans (IARC, 1987). Meta dichlorobenzene has not been evaluated for carcinogenesis by the IARC. The p-DCB NTP bioassay resulted in equivical results for F344/N ratio and B6C3F1 mice with renal tumors and p-DCB may act as a promoter (NTP, 1987).

InVitro Studies

Carey and McDonough (1943) found evident of chromosomal abnormalities in Allium exposed to p-DCB. A study by Sharma and Bhattacharyya (1956) reported the same results in plant tissues. Sharma and Sarkar (1957) found p-DCB caused meiotic cell abnormalities in flower buds. Srivastava (1966) and Prasad (1970) also came to the same conclusion various genera of the tribe vicieae.

Anderson's (1976) study of p-DCB exposure in various strains of Salmonella typhinurium found no dose-related mutagenic effects.

Ortho-dichlorobenzene, m-DCB and p-DCB were all nonmutagenic in the Ames test (Haworth et al., 1983). None of the three isomers induced unscheduled DNA synthesis uncultivated human lymphocytes (Perocco et al., 1983).

1,2-DICHLOROETHANE

1,2-Dichloroethane is used in the manufacture of vinyl chloride,solvents used for degreasing and tetraethyl lead. It is a man-made compound which has a pleasant smell. It was used in the past in household cleansers, pesticides, as tobacco flavoring as well as in wallpaper and carpet adhesives and some paint, varnish and finish removers. (Drinking Water and Health, 1977; ATSDR, 1989)

1,2-Dichloroethane is released in small amounts into water or onto soil and from there it can evaporate in to air. 1,2-dichloroethane is rapidly broken down by the sun after evaporation. 1,2-Dichloroethane can move through into water and remain in water or soil for 40 days. (ATSDR, 1989)

Human exposure occurs primarily through breathing it in air or through drinking contaminated water. Environmental contamination is usually a result of improper disposal or accidental spills onto the ground.

POTENTIAL ACUTE EFFECTS

Inhalation

Short-term exposure to high concentrations of 1,2-dichloroethane can relust in eye, nose and throat irritation. Some nausea and vomiting have also been reported case studies have reported death due to inhalation of 1,2-dichloroethane. No quantification of the total amount of exposure was reported. Evidence of toxicity at autopsy included congestion of the lungs, liver, and kidney necrosis, myocardial degeneration and shrunken nerve cells of the brain.(Nouchi et al 1984, Drinking Water and Health, 1980)

Acute inhalation in animals is also known to cause death. Lethal acute concentrations are reported at 400 ppm for guinea pigs and 1,500 ppm for mice, rabbits and dogs. (Spencer et al, 1951) Signs of toxicity at autopsy included liver and kidney effects ranging from increased organ weight to necrosis, degeneration of the myocardium and pulmonary congestion. (Heppel et al, 1945, 1946; Spencer et al, 1951). Spencer et al (1951) derivedan 8-hour LC50 for rats to be 1,000 ppm.

Intermediate exposure of 6 to 25 weeks results in death in rats and guinea pigs at 200 ppm and at 400 ppm in rabbits. Concentrations as low as 1000 ppm of intermittent exposure cause death in cats, dogs and monkeys. Observations were similar to those found in acute exposure and included effects on the liver, kidney, heart and lungs.(Spencer et al, 1951;Heppel et al, 1946)

Ingestion

Toxicity due to ingestion is reported as having very similar effects to those following inhalation. Death due to ingestion of 15 to 60 ml is cited in the literature. Most information is derived from case studies and reports. The specific quantity and the purity of the compound are generally not known. Reported quantities are therefore usually

estimations. (Smyth et al, 1969; Hueper and Smith, 1935; Lockhead and Close, 1951;Garrison and Leadingham, 1954; Shconborn et al 1970).

Ingestion of 1,2-dichloroethane by animals has also been observed to cause death. An acute LD50 of 680 mg/kg was reported for rats by McCollister et al (1956). Munson et al. (1982) derived an LD50 of 489 mg/kg for male and 413 mg/kg for female mice.

POTENTIAL SYSTEMIC EFFECTS

Longer-term health advisories (HA) for children and adults have been derived based on the studies conducted by Heppel et al, 1946; Hofman et al, 1971; Spencer et al, 1951. The NOAEL is considered to be 100 ppm and is converted to 7.4 mg/kg/day. Applying an uncertainty factor of 100, the longer-term HA for a child is 7.4E-1 mg/l and 2.6 E + O mg/l for an adult. (IRIS, 1989)

Respiratory Effects

Inhalation

Nouchi et al (1984) reported a case study of 1,2-dichloroethane short-term exposure. concentrations were not quantified however, respiratory distress was observed 20 hours after exposure. Findings at autopsy included edema and severe congestion of the lungs.

Pulmonary congestion was observed in mice, rats, rabbits, and guinea pigs after a one time 7-hour 3000 ppm exposure. Rats and mice exposed intermittently for 4-15 weeks to 100 ppm showed no signs of respiratory toxicity. The same is true for 25 week intermittent exposure to 200 ppm in rabbits and monkeys and 400 ppm intermittent exposure for 8 months in dogs. (Heppel et al, 1984)

Ingestion

Pulmonary edema, congestion and bronchitis have been reported after an acute lethal oral dose of 1,2-dichloroethane (Hueper and Smith, 1935; Lockhead and Close, 1951; Martinet al, 1969; Yodarken Babcock, 1973)

There is no evidence in the animal data to indicate that 1,2-dichloroethane produces respiratory toxicity after ingestion in animals. (ATSDR,1989)

Cardiovascular Effects

Inhalation

In the case study by Nouchi et al (1984) the cause of death was attributed to cardiac arrythmia. Findings of cardiac toxicity at autopsy included degenerative changes in the myocardium, interstitial edema, and loss of myocardia fiber nuclei.

Exposure to low dosed of 1,2 -dichloroethane does not appear to have cardiovascular effects. No cardiovascular effects were observed at concentrations ranging from 100 ppm in rats to 400 ppm in dogs.

Higher concentration exposure resulting in death has been associated with myocarditis and fatty infiltration of the heart in animals exposed to 200 ppm for 25 weeks (Heppel et al,1945, 1946)

Ingestion

Case studies of victims of acute ingestion exposure to 1,2-dichloroethane include cardiovascular effects in contributing factors to death. (Garrison and Leadingham, 1954;Hueper and Smith, 1935; Martin et al, 1969)

No studies regarding cardiovascular toxicity in animals after oral exposure to 1,2 - dichloroethane were located. (ATSDR, 1989)

Gastrointestinal Effects

Inhalation

Several case studies of patients exposed to 1,2 -dichloroethane have reported gastrointestinal effects including nausea and vomiting. (Nouchi, 1984; PCOC, 1966)

Exposure to 1,500 ppm 1,2 -dichloroethane for 7 hours/day for 6 days produced gastrointestinal tract effects in animals. (Heppel et al, 1945)

Ingestion

Gastrointestinal effects have been observed in victims of oral exposure to 1,2-dichloroethane. Symptoms include nausea, vomiting, and diarrhea. (Hueper and Smith, 1935; Lockhead and Close, 1951; Yodarken and Babcock. 1973) Findings at autopsy include hemorrhagic colitis, hemorrhagic gastritis and focal hemorrhages. (Garrison and Leadingham, 1954; Hueper and Smith, 1935; Lockhead and Close, 1951)

No studies regarding oral exposure and gastrointestinal effects in animals were found.

Hematological Effects

Inhalation

One study of only two monkeys was reported by Spencer et al (1951.) Hematological effects were observed in the monkeys at an exposure of 400 ppm for 7 hours a day, 5 days a week for 8-12 days.

Ingestion

Hematological effects including increased prothrombin time and reduced blood clotting were reported in case studies of patients who ingested approximately 40 ml (Martin et al, 1969) and 15 ml of 1,2 -dichloroethane. (Yodarken and Babcock, 1973)

Hematological effects have also been observed in animals. A 30% decrease in leukocytes was reported in mice who received 49 mg/kg/day (258 ppm) of 1,2 -dichloroethane. (Munson et al, 1982) In another part of the study, Munson et al, 1982 saw no changes as compared to controls when mice were exposed to up to 189 mg/kg/day. The authors suggest that a longer exposure time may allow 1,2 -dichloroethane to induce its own metabolism which contributes to lower toxicity.

Hepatic Effects

Inhalation

1,2-Dichloroethane is considered to be a powerful liver toxin. (Klaassen et al, 1986) The case study by Nouchi et al (1984) noted an enlarged liver, high serum levels of lactate, increased levels of hepatic enzymes and ammonia following inhalation exposure to 1,2-dichloroethane. Histopathological examination showed extensive necrosis.

Hepatic effects have been observed in animals. Brondeau et al (1983) reported liver enzyme induction in animals exposed to 850 to 1,340 ppm 1,2 -dichloroethane for 4 hours. Exposure to the same concentrations for 2 to 4 days resulted in lower enzyme induction. Exposure to 400 ppm for 8-12 days in monkeys produced degeneration of the liver. No effects were observed was observed at 100 ppm for 14 days. (Spencer et al, 1951) It should be noted that the studies consisted of small numbers of test animals.

An exposure concentration of 100 ppm, 200 ppm, 400 ppm for 6-30 weeks produced no signs of hepatic toxicity in mice, rats or rabbits. Guinea pigs showed a fatty liver and increased liver weight at 100 ppm. Guinea pigs and monkeys exhibited liver degeneration at 200 ppm. Dogs showed liver degeneration at 400 ppm 1,2 -dichloroethane . (Heppel etal, 1945, 1946; Spencer et al, 1951; Hofman et al, 1971)

Ingestion

Signs of hepatic toxicity also appear after oral exposure to 1,2 -dichloroethane. Case studies of poisoning of 30 to 40 ml of 1,2 -dichloroethane report severe liver cirrhosis, hepatocellular damage and necrosis (Przezdziak and Bakula, 1975; Garrison and Leadingham, 1954; Lockhead and Close, 1951)

A study in mice exposed to 4.9 and 49 mg/kg/day of 1,2 -dichloroethane showed no effect on liver weight or enzymes. Levels of up to 189 mg/kg for 90 days showed no signs of hepatoxicity. (Munson et al, 1982)

Another study exposed rats to dietary 1,2 -dichloroethane at 80 mg/kg/day for 5-7 weeks with no observation of increased liver weight. Another part of the study exposed to 25 mg/kg in the diet of mice for two years also showed no abnormal liver function. (Alumot etal, 1976)

Renal Effects

Inhalation

1,2-Dichloroethane is considered a powerful kidney toxic. (Klaassen et al, 1986) It is an acutely nephrotoxic as evidenced in the case study by Nouchi et al (1984). Kidney failure in conjunction with general organ failure was followed by cardiac arrest. Examination at autopsy showed tubular necrosis.

Only the study by Spencer et al (1951) reported on renal toxicity after acute exposure to 1,2-dichloroethane. Intermittent exposure to 400 ppm for 8-12 days produced increased kidney weight and tubular epithelium swelling in guinea pigs and degeneration of tubular epithelium in monkeys. No signs of nephrotoxicity were observed in monkeys exposed to 100 ppm of 1,2 -dichloroethane. Lower concentrations at longer exposure intervals in rats,guinea pigs, rabbits and mice produced no observed renal effects. Dogs exposed to 400 ppm intermittently for 8 months showed fatty changes of the kidney. (Spencer et al, 1951;Heppel et al, 1945, 1946; Hofman et al, 1971)

Ingestion

One non quantified case study reported slight adverse kidney effects before recovery of the patient. (Pryezdziak and Bakula, 1975) Other case studies reported more severe renal toxicity upon autopsy following ingestion of 15-30 ml of 1,2 -dichloroethane. (Hueper and Smith, 1935; Lockhead and Close, 1951; Yodaiken and Babcock, 1973.

No adverse renal effects were noted in oral administration of 49-189 mg/kg d of 1,2 -dichloroethane in mice for 90 days or in rats at 25 mg/kg for 2 years. (Munson et al, 1982;Alumot et al; 1976)

Humans are more sensitive to the renal toxicity for 1,2-dichloroethane. The lower response in animals may be due to inter species metabolic differences (ATSDR, 1989)

Neurological Effects
Inhalation

Neurological effects such as central nervous system depression, irritability, headache, nausea, partial paralysis, coma, and Purkinge cell changes in the cerebellum have been reported in the case studies of acute inhalation poisoning of 1,2 -dichloroethane. (Nouchi;1984; PCOC, 1966)

Rats exposed to 12,000 ppm and 20,000 ppm for 30 minutes exhibited central nervous system depression. Exposure to 20,000 ppm for 15 minutes resulted in central nervous system depression to the point of death. (Spencer et al, 1951) Effects in rats, guinea pigs and rabbits exposed to 3,000 ppm of 1,2-dichloroethane for 7 hours included tremors,abnormal gait and narcosis. (Heppel et al, 1945) Dogs exposed to 400 ppm 1,2-dichloroethane showed no central nervous system effects. (Heppel et al 1946)

Ingestion

The case studies of acute oral exposure to 1,2-dichloroethane is also associated with central nervous system depression as well as morphological changes. Abnormalities include changes in cerebellar cells, changes in parenchyma of brain and spinal cord, degeneration of the myelin sheet, as well as hemorrhage of the brain. 1,2-Dichloroethane is equally toxic to gasoline, benzene, carbon tetrachloride and chloroform in humans at greater than 1 hour exposure. (Harrison and Leadingham, 1954; Hueper and Smith, 1935; Lochhead and Close, 1951)

No studies regarding neurological effects in animals after ingestion were found. (ATSDR,1989)

POTENTIAL CARCINOGENIC EFFECTS

1,2-Dichloroethane is classified by EPA's weight of evidence as a B2 carcinogen. It is therefore considered a probable human carcinogen. There is sufficient evidence in animals but not in humans. (IRIS, 1989, ATSDR, 1989)

The maximum contaminant level goal (MCLG) for Drinking Water is 0 mg/l. This MCLG is based on the carcinogenic effects of oral exposure in mice and rats. The maximum contaminant level (MCL) is set at 5 ug/l when technological and feasibility factors are considered. (IRIS, 1989)

Inhalation

Epidemiological studies investigating a possible excess incidence of brain tumors in two petrochemical plants and excess stomach cancer and leukemia in a ethylene oxide plant failed to provide a specific association between exposure to 1,2-dichloroethane and the development of cancer, probably due to confounding exposures to other chemical and solvents. (Austin and Schnatter 1983a, 1983b; Reeve et al, 1983; Waxweiler et al, 1983; Hogstedt et al, 1979)

Studies by Maltoni et al (1980) and Spencer et al (1951) provided no evidence of 1,2 - dichloroethane exposure associated with an increased risk of cancer in mice. The Maltoni(1980) study is considered inconclusive due to several factors limiting the study. However, metabolic pathway differences may affect the amount of the compound that reaches a target organ. (ASTDR,1989)

The inhalation slope factor is calculated from oral data and is estimated to be 9.1 E-2mg/kg/day. (HEAST, 1989; IRIS, 1989)

Ingestion

Study information on human ingestion exposure to 1,2-dichloroethane is limited. One study reported an association between exposure of 1,2-dichloroethane in drinking water and the development of colon cancer in men 55 or older. (Isacson et al, 1985) It is noted that exposure to other chemicals occurred and possibly confounded the conclusion.(ATSDR, 1989)

1,2-Dichloroethane's B2 classification is based on the positive carcinogenic evidence in rats and mice. The oral slope factor is 9.1 E-2 mg/kg/day and is based on the following study by NCI. (1978)

Remote location tumors have resulted from doses as low as 47 mg/kg/day in rats. Both malignant and nonmalignant tumors were reported in both rats at concentrations of 47 mg/kg/day and 95 mg/kg/day. Tumor locations in both dosage groups in rats included neoplasms of the spleen, pancreas, liver, and adrenal gland among others. Tumors were observed in the high-dose group in male rats in squamous cells of the forestomach and in the mammary gland in female rats. (NCI, 1978)

Female mice included in the NCI (1978) were exposed to 149 mg/kg/day and 299 mg/kg/day and male mice to 97 mg/kg/day and 195 mg/kg/day. Males in the 195 mg/kg/day group had an increased incidence of hepatocellular carcinomas and pulmonary adenomas. Females in both exposure groups showed increased incidence of endometrial polyps and sarcomas, mammary adenocarcinomas, and pulmonary adenomas.

POTENTIAL IMMUNOLOGICAL EFFECTS

Inhalation

No studies found regarding immunological effects after inhalation in humans. (ATSDR, 1989)

A study by Sherwood et al (1987) provided some evidence that 1,2-dichloroethane affects the immological defense of mice and rats against microbial infection. A 5 ppm exposure concentration for mice is reported to increased susceptibility to infection.

Ingestion

No studies were located to provide data on immunological effects often human ingestion of 1,2-dichloroethane. (ATSDR, 1989)

Suppressed immune responses however, was observed in mice following oral exposure through gavage to 4.9 (26 ppm) and 49 mg of 1,2-dichloroethane for two weeks. A 30% reduction in leukocytes was reported at the 49 mg/kg/day dose. However, exposure to 189 mg/kg/day in drinking waste resulted in no observed immunologic effects. The change in observations is suggested to be attributable to differences in administration and exposure duration. (Munson et al, 1982)

POTENTIAL DEVELOPMENTAL EFFECTS

Inhalation

No studies regarding developmental toxicity in humans were found. (ATSDR, 1989)

1,2-Dichloroethane did not produce a significant increase in development effects in rats during days 6-15 of gestation. Exposure concentration of 300 ppm in rats resulted in high maternal mortally and one example of total resorption of the litter. (Rao et al, 1980)

Rabbits exposed to 100 ppm and 300 ppm during showed no effects on pregnancy, litter size or fetal body measurements. Maternal death was observed at both exposure concentrations. (Rao, 1980)

Ingestion

Studies reported by Kavlock et al (1979) and Lane (1982) found no evidence of a positive association between exposure to 1,2-dichloroethane in drinking water and developmental toxicity in animals.

POTENTIAL REPRODUCTIVE EFFECTS

Inhalation

Two studies provide conflicting results on the reproductive toxicity in animals due to exposure through inhalation. Vozovaya (1977) found a significant increase in embryo mortality in rats following maternal exposure to 4.69 7 ppm 4 months prior to mating and during pregnancy. A one generation study by Rao et al (1980) however, found no adverse effects on fertility, gestation, and pup survival in rats at exposure doses up to 150 ppm.

Ingestion

Lane et al (1982) found no dose-dependent reproductive effects in mice due to oral exposure to 1,2-dichloroethane. Alumot et al (1976) reported the same in rats.

POTENTIAL GENOTOXIC EFFECTS

Inhalation

A study by Storer et al (1984) was inconclusive because of high mortality of the mice at the exposure doses. However, irreversible DNA damage was evident in mouse hepatocytes at 1,000 ppm 1,2-dichloroethane for 4 hours.

Ingestion

Oral exposure to ı00 mg/kg 1,2-dichloroethane resulted in irreversible DNA damage in mice. (Stour et al, 1984)

BIS[2-ETHYLHEXYL] PHTHALATE

Bis [2-ethylhexyl]phthalate (BEHP) is a member of a large group of phthalate estes utilized in the manufacture of plastics and plastic containers. BEHP is a commonly detected compound in environmental samples due to its widespread usage and as a potential laboratory contaminant (eg., organic solvents dissolve phthalates from plastic containers of unlined lids).

Non-Carcinogenic Effects

BEHP orally administered to rats and guinea pigs at doses of 19 and 64 mg/kg/day enhanced liver weight in female species. Slight nephritis was noted in kidney and the spleen had elevated eosninophilic granulocytes. The guinea pig was more susceptible to BEHP induced toxity than the rat (Carpenter et al., 1953). Based on this work, an oral RfD of 19 mg/kg/day was established.

Developmental Reproduction Effects

Administration of dietary levels of BEHP (up to 0.3%) resulted in dose-dependent decreases in fertility and increase embryo/fetal toxicity. At the high dose, damage to seminiferous tubules was apparent (NTP 1984; Singhe 1972; Shicot and Nishimura 1982).

Carcinogenicity

In an NTP chronic bioassay, hepatoullular carcinomas were noted on both male and female B6C3F1 mice and in female rates (NTP, 1982). The dose-response was positive and based on the data, a potency factor of 1.4 E-2 $(mg/kg/day)^{-1}$ was determined.

Genotoxicity assays indicate that BEHP is not a direct acting mutagen. BEHP is a peroxisome proliferator and is classified as a B2 carcinogen.

1,1,1-TRICHLOROETHYLENE

Trichloroethylene (TCE) is a man made or manufactured chemical. It has no natural source in the environment. TCE is used mainly for removing grease from metals in the automobile and metal industry. Eighty percent of the TCE produced is used in this industry. Other uses are as a solvent in household products such as paint strippers, cleaning fluids, and use as an ingredient in the manufacture of other chemicals.

In the general environment traces of TCE can be found in the air at 0.03 ppb and in the water at 1 to 2 ppb. Although the primary release is from evaporation during degreasing operations the chemical can also escape by leaching in water or evaporating from waste treatment or disposal operations.

Acute Effects of TCE. TCE in the air and water can enter the body via inhalation and ingestion respectively. Entry through skin contact is a much less important route of entry tot he body in environmental exposure. When breathed at high concentrations, TCE can cause dizziness, slowed reaction time, sleepiness and facial numbness. Irritation of the mucus membranes occurs simultaneously. Acute exposure to high levels can also cause liver and kidney damage and has caused cancer of the kidney, lung and liver in animals.

The LC50 for rats exposed for a four hour duration is 12,4000 ppm (Seigel et al. 1971). For humans the LC_{10} was reported at 2900 ppm by NIOSH in 1984.

Animal studies found 7,330 mg/kg to be a lethal oral dose for rabbits (NIOSH 1984). A lethal ingestion for humans is 7000 mg/kg (Sorgo 1976).

Systemic Effects. When inhaled, TCE effects the CNS, liver, kidney and bone marrow. In mice and rats inhalation exposure to 37 to greater than 75 ppm from 1 to 4 months cause defects such as liver and kidney enlargement and altered hepatic indices.

In rats exposed to greater than or equal to 50 ppm, for 8 hours per day for 5 days per week for 12 weeks, liver weight increased by approximately 25%. Kidney weight increased in mice exposed to greater than 75 ppm (Kjellstand, 1983).

Intermediate exposure to 320 ppm for 24 hours per day for 30 to 90 days changed the brain fatty acid composition in rats (Kyrkland, et. al, 1985).

Hematologic effects have been observed as well with continuous exposure to concentrations greater than 50 ppm in rats. Certain liver and bone marrow enzyme levels decreased while related heme synthesis enzymes in the liver increased (Fujita, et al 1984). Exposure to 2,790 ppm for 4 hours per day for 6 days per week for 45 days caused myelotoxic anemia in rabbits (Mazza and Brancaccio, 1967).

In humans, the short term effects as described previously can occur when concentrations reach a threshold of 81 to 110 ppm Noyiyama and Noyiyama, 1974, found that exposures 81 ppm for four hours caused headaches in human volunteers.

Exposure studies of TCE by ingestion indicates that the kidney, liver and immunological system are the principal target organs. Acute short term exposure found that liver weights increased and the hematocrit decreased. The immune response also decreased. Dosages of greater than 500 ppm for 5 day per week for 3 weeks caused liver weight increases in mice (Stott et al 1982).

Studies of the immune status of mice exposed to TCE in drinking water showed that females were more susceptible. Depressed cell mediated immunity to foreign erythrocytes occurred with exposure to greater than 18/mg/kg/day for four months. Bone marrow stem cells were effected after 4 to 6 months.

Carcinogenic Effects of TCE. To date, the available human data is insufficient to confirm or refute carcinogenicity of TCE (EPA Group B2). At the time of this writing the carcinogen assessment summary in the IRIS data base had been withdrawn for further review.

Several studies have confirmed an association to specific cancer forms while others have found no relationship. Cancers in workers occupationally exposed found that workers usually had also been exposed to multiple solvents so the effects of TCE alone could not be determined (Blair, et al 1979).

Animal studies have been able to determine a relationship between TCE inhalation exposure and cancer. In animal inhalation studies, hepatocellular carcinomas in mice exposed for 6hr/day for 5 days per week for 24 months occurred but the results were not reproduced by rat studies. Other cancers such as of the testicles, renal adenoma and lung adenoma have also been found in TCE testing (Maltoni, et al, 1986).

Other Effects of TCE. Inhalation studies with rats and mice indicate that TCE is feto toxic but not teratogenic (ATSDR 1988). Skeletal anomalies were observed. Oral studies have not shown any effect on reproduction.

TETRACHLOROETHYLENE

Tetrachloroethylene is a liquid solvent used widely in the dry-cleaning industry. It is also used for degreasing metals. In addition, tetrachloroethylene is used in the manufacture of other man made chemicals. (ATSDR)

Tetrachloroethylene is also known as perchloroethylene, perc, PCE, perclene and perchlor.

Environmental levels of tetrachloroethylene are very low. Higher concentrations are encountered in occupational settings such as dry-cleaning or degreasing operations.

Potential Acute Effects

Inhalation

Human

One reported death due to acute exposure to tetrachloroethylene was found. The exposure concentrations was unknown but high levels were found in the blood and brain (4.4 mg/100 ml and 36 mg/100 g respectively). (Lukaszewski, 1979)

Animal

The lowest concentrations of a study by Friberg et al (1953) in mice exposed for four hours observed to produce death was 3,000 ppm. Another study reported a lowest concentration to produce death in mice or rats was 2445 ppm. (NTP 1986)

Ingestion

Human

Tetrachloroethylene is not considered to be highly toxic to humans if ingested. It is used medically for the treatment of hookworms. Medically, beneficial doses of 2.8 to 4.0 ml is considered safe with the only side effect being inebriation-like symptoms. (ATSDR Toxicological Profile)

Animal

An oral LD50 for mice was reported at 8100 mg/kg by Wenzel and Gibson (1951). A study by Hayes et al., (1986) fed rats 3835 and 3005 mg/kg. General CNS depression were observed before death but no abnormal findings except lung and adrenal hemorrhage was reported at autopsy.

Potential Systemic Effects

Neurotoxicity

Inhalation

Human

A study by Rowe et al (1952) exposed subjects to 106 to 1060 ppm of tetrachloroethylene. No CNS effects were observed at the lowest concentrations after 1 hour. Some reports of slight dizziness at 216 ppm for 2 hours were recorded. Exposure to 1060 ppm proved so irritating to the eyes and upper respiratory tract that the longest exposure periods attained was 1 to 2 minutes. Complete recovery occurred upon cessation of exposure.

Stewart et al., (1970) found that exposure to 101 ppm for 7 hours produced headache, dizziness and general CNS depression. Only one exposure concentration was used and no controls were included.

Stewart et al., (1977) studied exposure to 0, 25, or 100 ppm tetrachloroethylene. Effects at 100 ppm included changes in Flanagan coordination scores. A study by Hake and Stewart (1977) also concluded the same. These studies suggest a threshold of 100 to 200 ppm for CNS effects after acute exposure humans.

Inhalation

Animal

Studies show CNS effects after acute exposure to tetrachloroethylene concentrations ranging from 0 to 320 and 7100 ppm. (Savolainen et al, 1977; Rosengren et al, 1986; Briving et al,1986; Kyrklund et al, 1984; Carpenter 1937; Rowe et al, 1952; Goldberg et al, 1964)

Oral

Human

Few studies report the effects of ingesting tetrachloroethylene. The effects seem to parallel those observed after inhalation (ATSDR Toxicological Profile)

Hepatic Effects

Inhalation

Human

Tetrachloroethylene is considered to be a hepatoxin in animals and humans. The types of effects observed are documented but exposure concentrations are often not available. Human exposure is often accidental and impossible to quantitate. Animal data is difficult to interpret due to different exposure schedules and endpoints.

Tetrachloroethylene is thought to be hepatotoxic. However, the only available evidence consist of case studies with unreliable quantitative exposure information. Effects observed include cirrhosis and toxic hepatitis. (Hake and Stewart, 1977; Levine et al, 1981)

Inhalation

Animal

Fatty degeneration of the liver was reported by Kylin et al (1963) after one four hour exposure to 200 ppm tetrachloroethylene.

Other studies report in mice increased liver weight and histological alterations at concentrations from 0 to 150 ppm. (Kjellstrand et al, 1984; Carpenter, 1937; Rowe et al., 1952; NTP, 1986)

In a 1952 study by Rowe et al guinea pigs were found more susceptible to tetrachloroethylene.

An oral RFD of 1E-2 mg/kg/day was based on a study by Buben and O'Flaherty (1985). Mice were exposed to tetrachloroethylene in concentrations from 0 to 2000 mg/kg 5 days/wk for 6 weeks. 100 mg/kg was the dosage where the first signs of toxicity were observed. Liver weights were significantly increased at 100 mg/kg. Decreased DNA content, increased SGPT, decreased GGP, necrosis and degeneration were observed at higher concentrations.

Oral

Human

Fatty degeneration of the liver, and hepatomegaly were reported after human ingestion of tetra (Koppel et al, 1985)

Oral

Animal

Hayes et al (1986) exposed rats to 0 to 1400 mg/kg/day of tetrachloroethylene in drinking water. Liver weight was increased at 1400 mg/kg/day. No gross pathological changes were reported, but overall body weights were lowered in the highest dosage groups of males. This study was used as a basis to estimate a no observed effect level of 14 mg/kg/day. (IRIS)

Renal Effects

Effects of tetrachloroethylene in the kidneys is documented in animals (rodents) but not in humans. However, it is an expected renal toxin in humans due to the correlation of effects incase studies.

Inhalation

Human

Reports of unquantified exposure concentrations and related nephrotoxicity imply but do not document a causal relationship (Hake & Stewart, 1977); Larsen et al, 1977)

Inhalation

Animal

Carpenter (1937) exposed rats to tetrachloroethylene ranging from 0 to 470 ppm for 8h/day, 5 day/week for 7 months. Kidney effects were reported at concentrations at 230 and 470 ppm.

Rowe et al (1952) did not observe abnormal renal function or changes in rats, rabbits, guinea pigs, or monkeys exposed to 0400 ppm for 7 hours/day, 5 days/week, for 6 months. Another group of guinea pigs in the study received 14 exposures to 400 ppm in 18 days with a resulting increase in kidney weight.

Oral

Human

Specific studies of renal effects after ingestion of tetra chloroethylenein humans was not available. However, Koppel (1985) reported acute renal failure as possible late state results of acute ingestion of tetrachloroethylene.

Oral

Animal

Concentrations of 0-1400 mg/kg/day were given to rats in drinking water for 90 days. Kidney weight was increased in males at > 400 mg/kg/day and also in females at 14 mg/kg/day. No) histological changes were observed in any dose group (Hayes et al, 1986)

Another study included exposure to 450 and 550 mg/kg/day for male mice, 300 and 400mg/kd/day for finally mice 471 and 941 mg/kg/day male rats and 474 and 949 mg/kg/day for female rats for 5 days/wk for 78 wks. Signs of nephrotoxicity were observed at all dosage concentrations for each groups (NCI, 1977)

Immunotoxicity

Inhalation

Animal

One study suggests a possible association between tetrachloroethylene exposure and increased susceptibility to respiratory infections in mice. (Aranyi et al, 1986) The interpretation of data is not conclusive. No human data was available.

Cardiotoxicity

Case studies of occupationally - exposed workers suggests an association between exposure to tetrachloroethylene - and the development of heart effects. However, definitive human evidence is lacking because of lack of exposure quantification. Animal studies provide data for enhanced sensitivity after intravenous injection but not inhalation.

Inhalation

Human

A study by Hara et al (1985) evaluated occupationally exposed workers. Exposure levels were not quantified but intensity of cardiac effects seemed to correlate with increased exposure levels. The researchers stated that there was no evidence of a cause and effect relationship and exposure to other solvents could have confused results.

A case study of one dry-cleaning worker who experienced symptoms one month after employment provides evidence for an association. Symptom ceased upon cessation of exposure and returned up re-entering work at the dry-cleaners. (Abedin et al, 1980) Exposure concentrations however were not know.

Inhalation

Animal

A study by Reinhardt et al (1973) evaluated the potential for tetrachloroethylene - to sensitize the heart to epinephrine in dogs. No causal relationship was reported.

A study on rabbits, cats, and dogs to intravenous injections of tetrachloroethylene and subsequent sensitivity to epinephrine was reported by Kobayashi et al (1982). It was concluded that increased sensitivity occurred in all three species. The authors also noted that the same effects may not be seen in humans due to limited pulmonary absorption.

Developmental Toxicity

Inhalation

Human

No conclusive evidence of a cause and effect relationships between inhaled tetrachloroethylene and developmental effects in humans was available.

Inhalation

Animal

The observation of feto toxicity at concentrations also toxic to the mother have been reported in rats and mice. The effects are observed at 300 ppm. (Schwetz et al (1975))· Ghantous et al (1986) reported high amniotic fluid of mice concentration of a tetrachloroethylene metabolite after exposure through inhalation. It has been postulated that this observation may serve as the basis for defining the mechanism of embryo toxicity.

Reproductive Toxicity

Little information regarding the effects of tetrachloroethylene on reproduction exits. Conclusive evidence that tetrachloroethylene or its metabolites produces changes in genetic material of animals or humans is unavailable.

Genotoxicity

Human

No increased in chromosomal aberrations in lymphocytes observed in occupationally exposed workers in a study by Ikeda et at (1980)

Nonhuman

Studies in prokaryotes provide negative evidence of genotoxicity. Studies in yeast or mammalian cells provide mixed results probably due to impurities in cultures. (ATSDR Tox Profile)

Potential Carcinogenic Effects

Tetrahclorethylene is classified in Group B2 according to EPA's weight-of-evidence criteria. It is a probable human carcinogen, but unequivocal human data does not exist at this time. There is definitive animal data to support it's carcinogenicity.

Inhalation

Human

Occupationally exposed workers in the dry-cleaning industry participating in epidemiological studies show an increased cancer mortality. Cancer of the lung, cervix, kidney, skin and/orcolon ar predominant. The data must be considered inconclusive because of exposure to other solvents, smoking, and socioeconomic status as confounding factors. (Blair et al, 1979; Kaplan, 1980; Katz and Jowett, 1981; Duh and et al, 1984; Brown and Kaplan, 1985)

A subgroup of the Brown and Kaplan (1985) group with 23 years of employment showed 1 an increased risk of kidney, bladder and cervical cancer.

Inhalation

Animal

A study on rats and mice with exposures ranging from 0-400 ppm for rats and 0-200 ppm for mice found a significant increase of mononuclear cell leukemia in rats. Although not statistically significant, usually uncommon renal tubular cell adenomas or adenocarcinomas were also observed in males. In mice, the incidence of hepatocellular carcinomas was increased. (NTP, 1986)

One study by Rampy et al (1978) found no statistically significant increase of tumor incidence in rats.

Ingestion

Human

Data no available

Ingestion

Animal

Rats and mice were exposed through gavage to tetrachloroethylene in the NCI (1977) study. No increase risk of cancer was observed in rats. However, the incidence hepatocellularcarcinomas in mice was increased.

Dermal

Animal

Tetrachloroethylene when applied to the skin of mice was not found to be carcinogenic (Van Duuren et al, 1979)

TABLE INFORMATION

		Inhalation	Ingestion=0
1)	RfD Uncertainty Factor	NA	1000
2)	CPF	5E-3 [3.3E-3]	5.1E-2
3)	Carcinogenicity Classification	B2	B2

TRIHALOMETHANES

Trihalomethanes (THMs) can be formed when chlorine used to disinfect drinking water reacts with organic compounds in the water (precursors) at levels typically in chlorinated municipal supplies. The most common THMs formed are chloroform, and bromodichloromethane.

However, when bromide ions are present in water, dibromochloromethane and bromoform are also frequently produced (Cancer Rates and Risks, 1983; Crump and Guess, 1982; Zierler et al,1988; Viessman and Hammer, 1985). In certain cases the brominated THMs are the most dominant. Many natural water contain bromideions which are oxidized to bromine. Bromine in drinking water can greatly increase the THM level because of its increased reactivity(Viessman and Hammer, 1985).

There are some weak associations that THMs may increase risk of gastrointestinal and urinary tract cancer (Crump and Guess, 1982).

Acute Toxicity

Acute toxicity is characterized by necrosis and cirrhosis of the liver and kidney as well as central nervous system effects. THMs left on the skin may produce burns (DW&H, 1977; Sittig, ASTSDR, 1989).

Systemic Effects

Occupationally exposed workers exhibit hepatic effects. Dogs and rats are also found to be sensitive to the hepatic effects of THMs (ATSDR). Alcoholics appear to be more sensitive to chloroform exposure. In additional, central nervous system effects and renal toxicity are evident but not as prevalent (Sittig, 1985).

Carcinogenic Effects

Some studies have found a statistically significant increase in the incidence of certain types of cancer correlated to exposure to THM's.

Carlo and Mettline (1980) found a increase of pancreatic cancer in while males due to exposure to THMs. Gottlieb et al (1989, 1981) found a strong association between rectal cancer and Mississippi River water.

Kanarek and Young (1980) examined the relationship of chlorinated drinking water and cancer at several sites. A significant association between colon cancer and chlorination of water was found.

Chlorinated water as cited in case control studies carries with it about 1.1 to 2.0 times higher risk of rectal, bladder, and colon cancers.

Chloroform is classified as a B2 carcinogen due to its weight of evidence in animals. The human data is not considered sufficient to classify it as a definite human carcinogen (IRIS).

Extensive studies in rats and mice indicate an association between exposure to chloroform and other THMs and the development of tumors in the kidney and liver. Exposure concentration ranged from 0 to 1800 mg/l of chloroform. The key studies as cited are the basis for its cancer potency factor set by EPA are the NCI (1976) bioassay in rats and mice,the study by Roe et al (1979) in mice and Jorgenson et al (1985) in rats and mice.

Chloroform has been listed as a Class B2 carcinogen with an oral potency of 6.1E-03 $(mg/kg/day)^{-1}$. Bromofirm, bromodichloromethane and dibromochloromethane are currently being reviewed by NTP for possible carcinogenicity (IRIS, 1990).

Fetotoxicity/Developmental Toxicity

The embryotoxic potential of THMs has been identified in animals. Schwety et al (1974) and Murray et al (1979) found evidence of developmental toxicity of chloroform at exposure concentrations of 100 ppm and above.

The embryotoxic potential of THMs has been identified in animals. Schwety et. al. (1974) and Murray et. al. (1979) found evidence of developmental toxicity of chloroform at exposure concentratoins of 100 ppm and above.

The ambient water quality level suggested by EPA (1979) is zero. However a maximum contaminant level (MCL) for total trihalomethanes is proposed at 0.1 mg/l.

Toxicity Values

A RfD for trihalomethane has been established at 2E-02 mg/kg/day based on chronic gavage investigation. NOAL and LOAEL values for dibromochloromethane, bromodichloromethane and bromoform range from 17.8 to 42.0 mg/kg/day for hepatic lesions in rats and cytomegaly in mice.

Compound	Oral Cancer Potency Factor mg/kg/day	Weight of Evidence	— Source
bromodichloromethane	1.30 E-01	B2 a,b	
chlorodibromomethane	8.40 E-02	B2 a,b	
bromoform	7.90 E-03	B2 a,b	
chloroform	6.10 E-03	B2 a	

a = IRIS 1989, under review

b = HEAST, 1989

REFERENCE DOSE

Total Trihalomethanes	RfD = 2E-2 mg/kg/d MF = 1 UF = 1000

NOEL/LOAEL'S

NOEL—LOAEL	(mg/kg/day)		
Dibromochloromethane	21.4	42.9	(hepatic lesions in rats)
Bromoform	17.9	35.7	(hepatic lesions in rats)
Bromodichloromethane	None	17.9	(renal cytomegaly in mice)

The ambient water quality level suggested by EPA (1979) is zero. However a maximum contaminant level (MCL) for total trihalomethanes is proposed at 0.1 mg/l.

PHENOL

Phenol is white crystalline solid which is used widely in the production and manufacture of a variety of products. It has an acrid,aromatic odor. It has been estimated that as many as 10,000 workers are occupationally exposed to phenol during the production of paints, paint removers, asbestos goods, wood preservatives,rubber, fertilizer, coke and illuminating gas among others. It is also used as a disinfectant in other industry processes, such as the manufacture of soap, toys, leather and paper as well as in agriculture. Phenol is also known as carbolic acid, phenic acid, phenyl hydrate and hydroxybenzene among other synonyms (Sittig,1985).

Acute Effects

Phenol is a primary skin irritant producing corrosion of tissue upon contact. It causes a whitening of skin but does not cause pain, whereas it causes damage to the point of blindness in eyes. If the phenol is not removed quickly absorption can occur potentially leading to systemic toxicity (Sittig, 1985).

An acute lethality study done in conjunction with another study exposed rats to 10,000 ppm (780 mg/kg/day) in drinking water for 90 days. All animals survived the specified exposure period (NCI, 1980).

Systemic Effects

Developmental Effects

The oral reference dose (RFD) as reported by USEPAs Integrated Risk Information System (IRIS) is based on a study by NTP (1983) regarding the developmental effects of phenol is 6 E-1 mg/kg/day. The study included oral exposure of pregnant rats to 0, 30, 60 and 120 mg/kg/day on days 6 to 15 of gestation. Rats were sacrificed and examined on day 20 of gestation. Researchers observed no maternal or clinical signs of toxicity as related to dose received. Reported observations of significance included a reduction in fetal body weights in the 120 mg/kg/day dose group. A no observed adverse effect level(NOAEL) of 60 mg/kg/day was reported and is used as the basis for the derived RfD cited above.

Other Systemic Effects

Other studies report symptoms of the systemic toxicity of phenol as limited to reduced bodyweight or unspecified kidney inflammation in animals. A study by NCI (1980) exposured rats to 0 to 344 mg/kg/day and mice to 0 to 500 mg/kg/day for 103 weeks. Findings included both a dose-related reduction in body weight of male and female rats and mice and an increase in chronic inflammation of the kidney in all dosage groups of female rats and the highest dosage group of male rats. Comparable results were reported by a study conducted by the Armed Forces Institute of Pathology (1980). A lowest observed adverse effects level (LOAEL) of 313 mg/kg/day in mice and 344 mg/kg/day is reported in rats based on depression of body weight.

Another study by Dow (1945) reported lower NOAELs and LOAELs than the NCI (1980) study possibly due to differences in the mode of administration.

Carcinogenic Effects

The available data are considered insufficient at this time to completely assess the carcinogenic potential of phenol. The USEPA has evaluated the compound and is currently reviewing its findings (IRIS, 1990).

TOLUENE

Toluene is produced both naturally and as a by-product of certain refining and manufacturing processes. The vast majority of toluene is used as a component of gasoline. Toluene is a clear, sweet-smelling liquid that can be found in crude oil and the Tolu tree. It can also be found as a by-product of styrene production, petroleum refining, and coke-oven operations. Toluene is also known as methylbenzene and phenylmethane and has a molecular weight of 92.15. Toluene is classified as a hazardous waste under the Resource Conservation and Recovery Act (ATSDR, 1989).

Acute Effects

Inhalation. Very few studies regarding the acute toxicity and lethality of toluene. Human data is limited to case studies of workers who have occupational exposure or case studies of abusers of solvents for recreational use. It is noted that either of the potential exposure pathways above may involve simultaneous exposure to a variety of compounds.

There have been no deaths attributed to toluene exposure in the United States, whereas 80 deaths per year are attributed to toluene associated with solvent abuse in Great Britain(Anderson et al, 1985). Signs and symptoms of exposure are primarily characteristic of central nervous system depression. High concentration exposure produces reversible depression of the central nervous system. Even acute exposure concentrations sufficient to produce unconsciousness are not observed to produce long-term organ damage.

Central nervous system depression is also the most typical adverse effect observed in animals. A few animal studies of inhalation exposure in rats and mice suggest that mice area more sensitive species than rats. LC50 values have been reported at 5, 320 ppm (920 PP mg/kg) in mice (Svirbely et al, 1943) and 8,800 ppm (365 mg/kg) in rats (Carpenter et al,1976).

Ingestion Dermal. No data regarding actual oral exposure in humans and very little in animals was found.

The potential for acute lethality of toluene in animals following ingestion has been investigated by a number of studies. The range of LD50s found was 5.5 to 7.3 g/kg. Some evidence suggests that age may play a role with juvenile rats the most sensitive (Kimura et al, 1971; Smyth et al, 1969; Withey and Hall, 1975; Wolf et al, 1956).

No data was located on the acute toxicity of toluene through dermal exposure in either humans or animals.

systemic Effects

Respiratory Effects, Inhalation. Toluene is considered a respiratory irritant in both humans and animals. Occupationally exposed workers were observed to experience upper respiratory irritation at concentrations of 200 to 800 ppm of toluene over the course of several years (Parmeggiani and Sassi, 1954). A study by von Oettingen et al (1942)

Toluene reported no irritant effects in volunteers exposed to 800 ppm for 7 to 8 hours. Most other human data is occupational with confounding exposure to other solvents that proves the data to be equivocal.

Animal data also provides data on the upper respiratory effects of toluene. Effects in rats range from upper airway irritation (600 ppm) to pulmonary lesions (2,500 ppm and 5,000 ppm) (von Oettingen et al, 1942). A study by Bruckner and Peterson (1981b) which is considered comprehensive and well conducted reported no irritation or histologic changes of the respiratory tract at concentrations up to 12,000 ppm in rats and mice. No explanation was cited for the difference in results between the studies cited above.

The 1980 study by CIIT observed no histopathological changes attributable to toluene at a concentration of 300 ppm in rats. Concentrations of 600 ppm to 1,200 ppm produced inflammation of the nasal mucosa and degeneration of the epithelium in the 1989 study by NTP.

Ingestion/Dermal. Toluene is not considered toxic to the respiratory system through either ingestion or dermal exposure.

Cardiovascular Effects, Inhalation. Most deaths in Great Britain of solvent abusers are attributed to arrhythmia; however, toluene does not seem directly toxic to the cardiovascular system as to produce lesions or other histopathological effects. No histopathological lesions of the heart were observed in rats at concentrations up to 12,000 ppm for 8 weeks and 1,200 ppm for 24 months (Bruckner and Peterson, 1981b; CIIT, 1980; NTP, 1989). A no observed adverse effect level (NOAEL) of 1,200 ppm for chronic non-neoplastic cardiovascular effects based on the NTP (1989) study.

Ingestion/Dermal. The NTP (1989) also exposed rats to toluene through ingestion. Findings included and increase in heart weight in rats at 1,250 mg/kg/day for 13 weeks and myocardial degeneration in mice at 5,000 mg/kg/day for 13 weeks.

No oral exposure in humans or dermal exposure in animals or humans is reported regarding cardiovascular toxicity.

Gastrointestinal Effects, Inhalation. The NTP (1989) study reported slight but not significant increase in stomach ulcers in rats after 2 years exposure to concentrations up to 1,200 ppm of toluene.

Ingestion/Dermal. No adverse gastrointestinal effects were observed at exposure concentrations up to 5,000 mg/kg/day of toluene for 13 weeks (NTP 1989).

No studies were found regarding cardiovascular effects of toluene following dermal exposure in animals or humans.

Hematologic Effects, Inhalation. Hematological effects once associated with toluene in occupational exposures have since been re-evaluated and partially attributed to exposure to other compounds historically found as contaminants of toluene in the workplace such as

benzene (Greenburg et al, 1942; Wilson, 1943; EPA, 1985c). The most recent studies have for the most part been negative with the only potential adverse effect being a reversible decrease in blood leukocytes. Exposure concentrations of toluene (with benzene <0.01%) ranged from 20 to 200 ppm in the studies by Tahti et al (1981), Banfer (1961) and Capellini and Alessio (1971). The results of Tahti et al (1981) are considered neither conclusive nor completely invalid due to possible confounding exposure to other solvents and limited cohort size.

The USEPAs Integrated Risk Information System (IRIS, 1989) and the Health Effects Assessment Summary Tables (HEAST, 1989) report the Reference Dose (RFD) for toluene to be 3E-1 mg/kg/day based on hematological effects (IRIS, 1989) as well as central nervous system effects and eye and nose irritation (HEAST, 1989) as based on data reported in several studies by Anderson et al (1983) and CIIT (1980). The study conducted by CIIT (1980) exposed rat to concentrations of toluene of 30, 100, and 300 ppm for 6 hours/day, 5 days/week for 24 months. The only dose-related effect observed was reduce hematocrit values in females in the 100 and 300 ppm groups. A NOAEL based on 300 ppm was derived to be 1,130 mg/m3.

Ingestion/Dermal. No data found.

Musculoskeletal Effects, Inhalation. No data of musculoskeletal effects in humans follow inhalation exposure to toluene were found.

No adverse musculoskeletal effects were reported by the NTP (1989) study in mice and rats exposed to dosage levels up to 1,200 ppm of toluene for two years through inhalation. Similar results were reported by the NTP (1989) study following oral exposure at dosage levels up to 5,000 mg/kg/day.

Ingestion/Dermal. No studies found.

Hepatic Effects, Inhalation. The liver is not considered to be a primary target organ following toluene exposure. This is thought to be due to the extensive metabolism of toluene by the liver to possibly more nontoxic metabolites. Studies by Seiji et al (1987) and Lundberg and Hakansson (1985) found no significant hapatic effects attributable to toluene exposure.

Toxic hepatic effects in animals are limited to increases and decreases in liver weight with no significant changes in what is considered serious parameters of liver toxicity. A lowest observed adverse effect level (LOAEL) of 800 ppm for 7 days in rats, mice, and rabbits is reported based on data gathered by Ungvary et al (1982). Increased liver weights were observed by the same study at longer exposure times (3 weeks) at 800 ppm, whereas Bruckner and Peterson (1981b) reported decreased liver weights in rats at a concentration of toluene of 12,000 ppm for eight weeks. The 1989 study by NTP also reported increased liver weights in rats exposed to 1,250 ppm for 15 week.

Ingestion/Dermal. No data regarding ingestion exposure in humans or animals or dermal exposure in humans was located. Only one inconclusive study in animals following dermal exposure was found.

Renal Effects, Inhalation. The majority of the qualitative human data regarding adverse kidney effects through inhalation exposure comes from case studies of solvent abusers. Most effects on the kidneys could possibly be associated with exposure to other solvents so only limited if any conclusions can be drawn. However, the kidney does not appear to be a primary target organ of toluene in humans.

The most recent studies in animals observe no adverse histopathological changes in the kidneys of rats and mice at concentrations up to 12,000 ppm for eight weeks (Bruckner and Peterson, 1981b) or concentrations up to 1,250 ppm for 15 weeks (NTP, 1989). The NTP (1989) study did however report an increase in liver weight at the exposure concentration and duration cited above. The NTP (1989) study reported nephropathy an observed in tabular cysts at doses of 600 to 1,200 ppm. The conclusion that the renal tubular cysts are adose-related effect is backed up by the CIIT (1980) study which observed no such cysts at 300 ppm for 24 months.

Ingestion/Dermal. No studies were located regarding the ingestion or dermal exposure in humans or dermal exposure in humans. Again, only one study considered in conclusive was found of dermal exposure to toluene in animals and any associated renal effect.

Dermal/Ocular Effects, Inhalation/Ingestion. No studies found.

Dermal. Dermal exposure to toluene may cause skin damage. Some workers experiencing long-term exposure report unspecified abnormal skin conditions of the hands (Winchester and Madjar, 1986).

Testing of dermal/ocular irritation in animals proves toluene to be a moderate skin and eye irritant (Kronevi et al, 1979; Hazelton Laboratories, 1962; Carpenter and Smyth, 1946).

Neurological Effects, Inhalation. Central nervous system (CNS) effects following exposure to toluene through inhalation seems to be the primary effect in humans. Human volunteers exposed to 40 ppm did not experience significantly changed CNS response(Anderson et al, 1983). Exposure to moderate concentrations (200 to 800 ppm) produced CNS excitatory effects followed by narcosis. The development of CNS depression is reported to increase with increased exposure concentration and duration (EPA, 1985c; von Oettingen et al, 1942). Exposure to sufficiently high concentrations can depress the CNS to the point of death. High concentrations can also produce symptoms such as tremors,ataxia, speech, hearing and vision impairment, and intellectual and neuromuscular effects (Devathasan et al, 1984; King et al, 1981; Suzuki et al, 1983; Iregren, 1986; Hanninen etal, 1976).

The reported effects in humans are supported by animal studies. Bruckner and Peterson(1981a) observed a correlation between CNS depression and toluene levels in the brain. Hartmann et al (1984) studied toluene exposure in monkeys and found impairment of

both cognitive performance and motor abilities at concentrations below those which cause more severe CNS effects such as tremors and ataxia.

Honma et al (1982) reported changes in brain neurotransmitter levels in rodents following exposure to 4,000 ppm. Ikeda et al (1986) and Arito et al (1985) observed similar results at 400 ppm for 30 days.

Changes in brain morphology were reported by Kyrklund et al (1987) following exposure 2 to 320 pm for 30 days. In contrast, NTP (1989) did not report any microscopic changes in morphology at 1,200 ppm for two years. The NTP (1989) study did however report an increase in brain weight in rats and mice.

Toluene is also considered to produce changes in the auditory system. The 1984 (a,b)studies by Pryor et al considered 700 and 1,000 ppm to be the threshold for hearing loss in rats. Hearing loss was permanent in the high-frequency range.

Ingestion/Dermal. The 1989 study by NTP reported an increase in brain weight after oral exposure to 1,250 mg/kg/day of toluene for 13 weeks in rats.

Immunological Effects, Inhalation. Slight immunological effects in humans is thought to possibly be associated with the decrease in leukocytes in humans and animals. No definite data has been found to support this theory (Moszcynski and Lisiewicz, 1984;ATSDR, 1989).

Toluene exposure at concentrations of 2.5 to 500 ppm have been associated with an increased potential for upper respiratory infections (Arany et al, 1985; Suleiman, 1987).

Ingestion/Dermal. No studies found.

Developmental Effects

Inhalation. Toluene has been shown to produce adverse developmental effects in both humans and animals. Solvent abuse in pregnant women produced CNS dysfunction, limb anomalies and growth retardation in case studies of eight women. There is a great probability of confounding exposures to other solvents so limited conclusions can be drawn from these case studies (Holmberg, 1979; Goodwin et al, 1988).

Studies in animals have provided quantitative evidence for the developmental toxicity of toluene. A study by Courtney et al (1986) reported reproductive and fetal changes at exposure concentrations of 200 and 400 ppm. Based on these data a LOAEL of 200 ppm is indicated in mice.

Studies by Ungvary and Tatrai (1985) in mice and rabbits and Unguary (1985) in rats also provide evidence of developmental toxicity at moderate concentrations (100 to 400 ppm). ALOAEL of 267 ppm is reported for developmental effects in rats and rabbits.

Ingestion/Dermal

Toluene was not reported as a developmental toxicant following oral exposure by Seidenberg et al (1986) and Smith (1983). The LOAEL for developmental effects due to oral exposure is 2,350 mg/kg/day based on the study by Smith (1983).

Reproductive Effects

Inhalation. Data gathered from animals studies did not indicate toluene to be a reproductive toxicant. Exposure concentrations up to 2,000 ppm in mice showed no treatment-related reproductive or survival effects (API, 1981 and 1985). Rats exposed to 300 ppm for 24 months produced no histopathological changes of the testes or ovaries attributable to toluene exposure (CIIT, 1980).

Ingestion/Dermal. The study by Smith (1983) reported no effect on viable litter production after 2,350 mg/kg/day administered orally.

Genotoxic Effects

Inhalation. Available data, though inconclusive, suggests that toluene is not a human or (animal genotoxic agent. Some case studies of occupationally exposed workers reported an increase in sister chromated exchange (Schmid et al, 1985; Bauchinger et al, 1982). The importance of these findings in regard to the severity of genotoxic toxicity is not known. Other studies have found no correlation between occupational toluene exposure and changes in chromosomes or sister chromatic exchange (Haglund et al, 1980; Maki-Paakkanen et al,1980).

The only study found regarding genotoxic toxicity due to inhalation exposure in animals reported no induction of dominant lethal mutations in sperm cells of male mice (API, 1981).

Ingestion/Dermal No studies found.

CARCINOGENIC EFFECTS

Inhalation. No available data suggest that toluene is a cancer causing agent due to inhalation exposure. In fact, on retrospective cohort mortality study of oil refinery workers exposed to toluene as well as other chemicals indicated a rate of cancer deaths for the 1,008 male workers involved lower than that of the general population. The study did identify an apparent though not significantly significant association between the incidence of cancer and the duration of exposure (Wen et al, 1985). Limited confidence in the study is noted due to lack of historical monitoring and insufficient size of study population to detect small increases in the incidence of cancer.

No study in rats or mice produced an increased incidence of cancer at concentrations up to 1,200 ppm for two years (CIIT, 1980; NTP, 1989). Some limitations are noted regarding the CIIT (1980) study due to the fact that animals were thought to have been able to withstand higher dosing concentrations.

Ingestion/Dermal. Dermal exposure of toluene in mice was investigated by Weiss et al (1986). Increased inhibition of skin tumorigenesis in conjunction with the use of apromoter. Toluene is postulated to interfere through competition with the promoter compound receptor site or interferences with biological cell processes.

XYLENE

Xylene is found naturally in petroleum and coal tar. However, it is primarily a man-made chemical. Xylene occurs in three forms: meta-,ortho-, and para-xylene. "Total xylenes" is a mixture of the three isomers. Xylene is used to produce thinners, solvents, fuels, paints and cleaners. Xylene evaporates quickly and does not mix well with water.

ACUTE EFFECTS

Inhalation

Acute effects from high level exposure concentration includes central nervous system depression. Only one death is reported in a case study of three men exposed to paint fumes containing an estimated 10,000 ppm xylene for an exposure duration of several hours (Morley et al, 1979).

Acute xylene exposure in animals, as in man, is considered slightly toxic with LC50 values above 6,000 ppm (Hine and Yuidema, 1970; Carpenter et al, 1975).

Ingestion

Oral exposure to xylene in man has a low relatively acute toxicity with only one case reported death after a large quantity of xylene (ASTDR, 1990).

No deaths were observed in rats after ingestion of up to 1,000 mg/kg/day of xylene (ASTDR,1990).

SYSTEMIC EFFECTS

Respiratory Effects

Inhalation. Respiratory effects including nose and throat irritation, pulminary edema and lung congestion have been observed in humans and animals at concentrations as low as 100 ppm in short-term exposures and 20 ppm for longer-term exposures (Goldie, 1960; Hake et al, 1981; Klauche et al, 1982; Nersesian et al, 1985; Morley et al, 1970). No histopathological changes were reported.

Ingestion. No human studies were located. No significant histopathological changes were noted in rats at concentrations as high as 800 ppm (Hazleton Lake, 1988a, 1988b).

Cardiovascular Effects

Inhalation. There is limited human data available. No cardiovascular effects in humans were observed after exposure to 299 ppm xylene (Gamberale, et al, 1978).

Animal data is also limited but does not indicate high potential for carcinogenic effects (ASTDR,1990).

Ingestion. Few exposure related cardiovascular effects were observed in the limited amount of data regarding oral exposure to xylene in either man or animals (ASTDR, 1990).

Gastrointestinal Effects

Inhalation. Nausea, vomiting and gastric irritation were noted after inhalation of xylene. Symptoms ceased upon cessation of exposure (Goldie, 1960; Klaucke, et al, 1982; Nersesian, et al 1985).

Ingestion. Ingestion of up to 1,000 mg/kg/day of xylene in rats produced no adverse gastrointestinal histopathologic responses (NTP, 1986).

Hematological Effects

Studies of inhalation or ingestion exposure to xylene provide no evidence of memotalogical effects in humans or animals (ASTDR, 1990).

Hepatic Effects

Inhalation. Animal studies of xylene inhalation exposure show induction of a wide variety of hepatic enzymes in rats. Other effects include increased hepatic weight and ultrastructural changes (Kyrklund et al, 1987; Toftgard et al, 1981; Tatrai and Ungvary, 1980). Most effects result from intermediate length exposure periods.

Ingestion. Effects of hepatic toxicity after oral exposure are similar to that of inhalation exposure (ASTDR, 1990).

Renal Effects

Both inhalation and ingestion of xylene produce increased renal weight and increased renal cytochrome P-450 with no sign of histopathologic changes in animals (NTP, 1986; Hazleton Labs,1988a, 1988b).

NEUROLOGICAL EFFECTS

Inhalation

Humans have been noted to experience short-term memory loss, impaired reaction lime and decreased numeric ability after intermediate length inhalation exposure to xylene. As noted before acute exposure to xylene causes general central nervous system depression (Gamberale, 1978; Riihimaki and Savolainen, 1980; Savolainen and Fiihimaki, 1981b; Klaucke et al, 1982). It is noted that occupational exposures and case studies are usually confounded by exposure to other solvents.

Xylene studies in animals also provides evidence for neurotoxity following inhalation exposure. Signs of toxicity in animals include narcosis, incoordination, tremor, labored breathing, hearing loss and changes in brain biochemistry (Andersson et al, 1981, Carpenter et al, 1975; DeCeaurrizet al, 1983; Kyrklund et al, 1987; Rank, 1985; Wimolwattanapaun et al, 1987). Quantification of exposure concentrations producing toxicity in arrivals ranges from 113 ppm (in acute exposures to 2,000 ppm and 300 ppm to 800 ppm after intermediate exposures.

Ingestion

Neurotoxic effects after ingestion of xylene is less well defined than inhalation exposure. Signs of toxicity in animals included hyperactivity, convulsions, salivation and epistaxis (NTP, 1986; Dyeret al, 1988).

DEVELOPMENTAL EFFECTS

Both inhalation and ingestion of xylene produces and increased indicences of developmental effects including left palate and decreased body weight after maternal exposure. Inhalation exposure also produces fetal skeletal variations, resorptions and fetal organ hemorrhages (Bio/dynamics, 1983; Hudak and Ungrary, 1978; Litton Bionitics, 1978a; Mirkova et al, 1983; Shigeta et al, 1983;Marks et al, 1982).

CARCINOGENIC EFFECTS

Xylene is classified in Group D in EPA's weight-of-evidence classifications. It is not considered carcinogenic. There are not studies to implicate the positive carcinogenic potential of xylene (IRIS,1989, ASTDR, 1990).

ALDRIN

Aldrin is a member of the chlorinated cyclodiene insecticide family. Aldrin (45, 4aS, 5S, 8R, 8aR)-1,2,3,4,10,10-hexachloro 1,4,1a,5,8,8a-hexahydro-1,4:5,8-dimethanonaphthalene) (CAS No. 309-00-2)) is environmentally very persistant and is not registered for use in the United Sates.

Toxicity

As a member of the chlorinated cyclodiene insecticide family, aldrins toxicity is similar to chlordene and heptachlor. For a general toxicity profile, plan refer to chlordene in this section.

The major toxicity concerns are acute toxicity and hepatocellular carcinogenicity. The __ LD_{50} to rats is reported to range from 38 to 67 mg/kg and the dermal LD_{50} is reported as 98 mg/kg. The oran RfD is 3E-05 and the inhalation and oral cancer potency factors are 1.7 E+01.

CHLORDANE

Chlordane is a light yellow viscous liquid used primarily for the control of insects in crops and soil pests such as termites. It is similar to other chlorinated cyclodiene insecticides in use and toxicity. Prior to 1950 "early chlordane" contained an intermediate (hexachlorocyclo-pentadiene) which was later held to below one percent in the mixture (Hayes 1982). Chlordane produced after 1951 is known as "later chlordane" and is a mixture of at least 26 different components. Chlordane's only approved use in the USA since 1983 is for the control of underground termites (IPCS 1984).

Chlordane is stable in light and shows slow biodegradation. It is lipid soluble and therefore will tend to accumulate in adipose tissue. Chlordane shows little migration except for surface runoff due to its easy adsorption on soil particles. Leaching into groundwater is also minimized (IPCS 1984).

Most poisonings occur through accidental spills or attempted suicides. Studies have shown that human uptake through residues on food are rare and adverse outcomes are minimal. Reports of adverse occupational effects are also minimal (IPCS 1984).

POTENTIAL ACUTE EFFECTS

"Early chlordane" was known to be a respiratory tract irritant whereas" later chlordane" is not as irritating (Hayes 1982). Onset of symptoms usually occur 30 minutes to three hours after exposure. A human fatal dose is reported to be in a range of 6-60 g (IRIS). CNS effects are the most sensitive in acute human exposure. Chlordane is considered to be in the upper range of moderate toxicity (IRIS).

A study by Stohlman et al (1950) reported 100 percent fatality of 12 male rats within 10 days after being fed a diet containing 1000 mg/kg of chlordane, and after 70 days at concentrations of 500 mg/kg. Nine (9) out of 12 mice died within 100 days when fed 300 mg/kg of chlordane. It was also reported that daily doses of 50 mg/kg produced signs of toxicity (IPCS 1984).

POTENTIAL SYSTEMIC EFFECTS

Gastrointestinal Effects

Human

Ingestion

Residents of Chattanooga, Tennessee reported gastrointestinal symptoms after ingestion of chlordane contaminated drinking water. Eighteen percent of the residents of the 42 homes affected were symptomatic. Those affected by signs gastrointestinal irritation also showed CNS effects. Concentration exposure ranged from 0.1 to 92,500 ppb (Harrington et al. 1978).

Inhalation

Inhalation exposure can also result in gastrointestinal distress. After a spill of one percent chlordane in a subterranean library room there was observed a correlation with exposure and GI and CNS effects. Clean-up workers seemed to be most severely affected (NIOSH 1984).

Hepatic Effects

Human

Ingestion

There is little human oral exposure data with regard to liver function. A report by EPA (1980) suggest that liver effects are not a primary part of acute oral chlordane exposure.

Inhalation

The same report by EPA above did find an association in the development of jaundice and inhalation exposure to chlordane in termite-treated homes.

Several studies have concluded that there is no association between occupational exposure for chlordane and liver effects (Alvarey and Hyman 1953, Tishbein et al 1964, Princi and Spurbeck 1951).

Animal

Ingestion

The animal study by Velsicol Chemical Company which fed Fisher 344 rats 0, 1, 5 and 25 ppm of chlordane for 130 weeks. The first review of the data reported an increase in liver lesions in male rats at 25 ppm. However, a subsequent review and reevaluation reported no liver lesions in males at 25 ppm but did report liver lesions at 5 ppm in female rats (IRIS).

Growth Retardation Effects

Ingle (1969) fed 20 male and 20 female rats chlordane in a range from 0 to 35 mg/kg of alpha-chlordane; gamma-chlordane in a range from 15 to 75 mg/kg; or a 1:1 mixture from 5 to 75 mg/kg. Earliest growth retardation was apparent in rats fed 2 alpha-chlordane. Rats fed 35 mg/kg showed growth retardation after four months in males and five months in females (IPCS 1984).

Accumulation in Tissues

Studies of human adipose tissue have reported an average level of 0.1 ppm of the chlordane metabolite oxychlordane in the U.S. population. Individuals were not symptomatic so levels are not associated with toxic effects of chlordane. There was no significant change in the concentration over the five year period from 1979 to 1975 (Kutz et al. 1976, 1979).

Oxychlordane in human breast milk was found to range from 0.002 mg/l to 0.005 mg/l in random samples from subjects with asymptomatic infants (Barnett et al. 1979, Strassman and Kutz 1977).

Taguchi and Yakushiji (1988) reported a correlation between the length of inhalation exposure of chlordane in homes treated for termites and the concentrations in human milk fat. It is noted that air concentrations were not quantified.

Takamujai 1987 and Saito et al. (1986) found a strong correlation between chlordane residues in blood of pest control workers and the duration of exposure. Again concentration levels were not quantified.

POTENTIAL CARCINOGENIC EFFECTS

Chlordane is classified in the B2 category based on weight-of-evidence. It is therefore a probable human carcinogen. Three human epidemiological studies provided inadequate data because of problems in sample size, follow-up or confounding factors (IRIS).

Human

Inhalation

Cohort studies of occupationally exposed chlordane workers demonstrated no increase in general mortality or death due to specific cause including cancer (Ditraglia et al 1981, MacMahon et al 1988, Shindell and Ulrich 1986, Wang and MacMahon 1979. It should be noted that all the studies noted do have limitations due to unquantified exposure or confounding exposure to other pesticides.

Ingestion

No human oral carcinogenity was found.

Animal

Ingestion

Animal studies have shown increased incidence of liver carcinoma. Velsicol Chemical Company (1983) carried out a 130 week study on 80 male and 80 female F344 rats. The rats were fed 0, 1, 5, and 25 ppm of chlordane. No tumors were observed in female rats. However, a significant increased in liver adenomas in male rats was reported at 25 ppm.

A 1977 study by the NCI in rats found an increased incidence of neoplastic nodules of the liver in females but not in males.

Becker and Sell (1979) reported a 27 percent incidence of hepatocellular carcinoma after dietary exposure to a concentration of 3.25 mg/kg/day in mice.

There has been some discussion that chlordane could possibly be a species specific carcinogen in rats. The probability of chlordane as a human carcinogen would then be diminished.

Table Information

1. CPF

   Oral 1.3 E + O (mg/kg/day)-1 (HEAST)

   Inhalation 3.7 E - 4 (mg/kg/day)-1 (HEAST)

2. RFD

   Oral 6 E - 5 mg/kg/day (HEAST)

   Carcinogenicity Group
   B2

p,p' DDT

p,pl' DDT is a toxic, chlorinated insecticide that is environmentally persistent, highly lipophilic and subject to bioaccumulation. The insecticide was removed from general licensing in 1972 and has an oral RfD of 5.0 x 10^{-4} mg/kg/day.

Noncarcinogenic Effects

DDT and its family of conginers DDD and DDE originated as insecticides in the early 1940's. It is acutely toxic to mammals and insects ($LD_{50\ oral,\ rat}$ ≈ 115-800 mg/kg) and its mechanism of toxicity is primarily neurological.

Oral administration of 10 mg DDT/kg body weight/day did not induce respiratory effects in rodents and no respiratory effects have been noted in humans exposed to DDT (ACTDR 1989). Likewise, no cardiovascular or gastro-intestinal effects were noted in laboratory animals or humans (deWaziers and Azais 1987 Hayes et. at, 1956).

Hepatic effects include induction of mixed function oxidase enzymes, increased liver weight, increased serum GST and SGPT and histopathological changes (Garcia and Mourelle, 1984). Chronic exposure to DDT (10-80 mg/kg/day) in various rodent species results in increased liner weight and cellular necosis (NCI 1978). NOAEL values for hepatic effects range from 0.05 mg/kg/day to 32 mg/kg/day (ATDR, 1989).

Developmental and Reproductive Effects

Developmental effects of oral DDT include fetal mortality, decreased fetal body weight and neurological/behavioral anomalies (ASTDR, 1589). There are no current developmental investigations for man. Tissue level DDT concentrations have been associated with decreased reproductive success in several ecologically important species due to egg shell fragility.

Reproductive effects of DDT include decreased implantation, decreased male fertility and decreased testicular weight (Krause et. at 1975). Multigeneration, reproductive assays with chronic DDT dosing resulted in delayed estrus, lack of mammary gland development and enhanced still births and resorption (Deichmann et. al 1971). There are not human reports of reproductive effects due to DDT.

Genotoxicity and Carcinogenicity

DDT induces an increase in the dominant lethal response in mice (Clark 1974). DDT at chronic levels induced a decrease in sperm cell development and delayed spermatogenesis. No chromosomal aberrations have been attributable to DDT.

DDT, DDD and DDE are tumorigenic in rodent species but not in dogs, primates and there are no epidemiological reports for man (ASTDR, 1989). The major organ site for tumor development is the liver with the induction of hepatocellular carcinomas in mice, rats and hamsters. Chronic doses range from 0.26 mg/kg/day up to 83 mg/kg/day (Cabral et.al 1982a; Agthe et.al 1980). Dose-response investigations support the concept that DDT is a

hepatocellular carcinogen in CFI mice, inducer of lung adenoma of CFI mice and thyroid tumors in F344 rats (MCI 1978). Based on dose response studies, DDT has an oral potency factor of $3.4 \times 10^{-1}(mg/kg/day)^{-1}$ (EPA 1988) and classified as a B2 carcinogen.

HEPTACHLOR

Heptachlor is a highly toxic member of the persistent chlorinated cyclopentadiene family that was utilized as an insecticide until 1978. The compound is highly lipophilic, bioaccumulates and does not degrade rapidly. The oral RFD for heptachlor is 0.0005 mg/kg/day.

Non-carcinogenic effects

Acute oral toxicity to rodents and insects places heptachlor in the very toxic category (LD_{50}, oral, rat = 60 mg/kg) (Podowski et.al, 1979). In acute doses, heptachlor induces neurologic hyperactivity, tremors, convulsions and death by respiratory paralysis (ASTDR, 1987). No published human data adequately describes neurological symptoms or effects.

Oral administration in acute investigations indicated increased incidence of kidney granulomas, histiocytes, and eosinophilic granulocytes (Akay and Alp, 1981). There is no human data on this reported effect.

Oral administration of 1 mg/kg/day heptachlor to rats for 28 days resulted in increased numbers of red blood cells and eosinophilic white blood cells and splenic fibrosis was noted (Enan et. al, 1982). The data base indicates no appropriate human data.

Developmental and Reproductive Effects

Cataracts were noted in the progeny of rats fed up to 6 mg/kg/day for 3 months prior to mating (WHO 1984). Examination of human populations in Hawaii exposed to unknown but environmentally significant levels of heptachlor and heptachlor epoxide (sufficient to increase levels of up to 5 ppm in human milk) indicate no significant effects on fetal or neonatal death or incidence of decreased birth weight (Le Marchand et.al, 1986). Investigations in rodents indicate that in a three generation reproductive study, the number of resorbed fetuses increased and fertility decreased (Cerey and Ruttkay-Nedecka, 1971).

Genotoxicity and Carcinogenicity

Gene mutation assays in rodent and bacterial cells indicated inconclusive results for mutagenicity (ASTDR, 1987). Weak mutagenic activity was detected in plant cells (Gentile et. al, 1982). Chromosomal aberrations in CHO cells indicate clastogenic activity in vitro (NTP 1987). A dominant lethal assay of orally administered heptachlor indicated negative results for clastogenic activity in male germinal cells (Epstein et. al, 1972). In contrast, heptachlor and heptachlor epoxide induced dose-dependant increases in UDS in a transformed, human cell line (Ahmed et. al, 1977). Heptachlor and its epoxide interfere with gap junctional communication in rat liver epithelial cells which is indicative of potential epigenetic activity (Kurata et. al, 1982; Telang et. al, 1982).

Chronic oral ingestion of heptachlor increased the incidence of hepatocellular carcinomas in both C3H and B6C3F1 mice and CFN rats (CAG, 1986). Based on published rodent data, heptachlor as a human potency (Q_1*) of from 0.83 mg/kg/day to 36.2mg/kg/day.

In human cohort investigations involving pesticide applicators and termite control operators exposed predominantly to heptachlor and chlordane, skin tumors and bladder tumors were significantly enhanced. (Wang and MacMahon 1979a). A study of workers involved in heptachlor production indicated a statistically significant enhancement of lung cancer in workers less than 35 years of age at occupation initiation and less than 50 years of age (Wang and MacMahon 1979b). There have been no human investigations that indicate the liver as a target organ as it is in rodents. Nevertheless, heptachlor and it epoxide have been classified as probable human carcinogens Group B2 with a cancer potency slope factor of 4.5 mg/kg/day.

HEPTACHLOR EPOXIDE

See Heptachlor

POLYCHLORINATED DIBENZO DIOXINS AND FURANS

Polychlorinated dibenzo dioxins (PCDD) and furans (PCDF) are often considered together because of their close structural relationship and comparable toxicity. The literature published on dioxins, specifically 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), is extensive. In contrast, literature pertaining to the toxicity of the PCDFs is limited. For the purposes of assessing human health risks, the PCDFs and the PCDDs are assumed to exhibit similar toxicities with varying potencies.

Physical and Chemical Properties

PCDDs and PCDFs are tricyclic, chlorinated aromatic compounds. They are normally by-products of the production, use, and disposal of chlorinated phenols and their derivatives. PCDFs occur during the manufacture and incineration of PCBs (Brinkman and DeKok, 1980). Some PCDDS and PCDFs were generated during early manufacturing preparations of the herbicide 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) which was one of the constituents of Agent Orange used extensively in Vietnam. Hence, this was a major source of human exposure to PCDDs (IARC, 1977).

Human Toxicity

Symptoms of acute exposure to mixtures containing PCDDS include nausea, vomiting, headache and signs of irritation of the eyes, skin and respiratory tract. Chloracne is the most characteristic and frequently observed effect of PCDD exposures (acute and chronic). In addition, systemic signs of chronic exposure include altered function of the neuromuscular system, liver, kidneys, pancreas, altered serum enzymes, hyperpigmentation and hyperkeratosis.

Chlorinated dibenzodioxins and dibenzofurans, most notably the 2,3,7,8-tetrachlorodibenzo-*p*-dioxin, are suspected of causing or contributing to soft tissue sarcomas (STS), lymphomas (Hodgkin's and non-Hodgkin's), and stomach cancer. Their carcinogenic potency has been examined through a number of cohort and case-control studies of occupational exposure to herbicides. The exposures were not to pure TCDD or TCDF, rather chemical mixtures contaminated with low levels of several congeners of these compounds. Exposure has occurred primarily in forestry and agricultural workers handling herbicides 2,4-dichlorophenoxyacetic acid salts (2,4-D) and 2,4,5-trichlorophenoxyacetic acid salts (2,4,5-T) and through exposure to mixtures of trichlorophenolic wood preservatives. Widespread accidental environmental contamination occurred in Yusho, Japan in 1968 and in Seveso, Italy in 1976.

Two case-control studies conducted in Sweden (Hardell and Sandstrom, 1979; Hardell and Eriksson, 1981) detected a five to six-fold increase in STS in workers exposed to herbicides believed to contain chlorinated dibenzodioxins and dibenzofurans. Subsequent cohort investigations from the US (Zack and Suskind, 1980; Cook et al. 1980; Ott et al. 1980) and New Zealand (Smith et al. 1983) have not substantiated the earlier Swedish findings. However, Coggon and Acheson (1982) point out that 3 out of 4 of the negative studies were designed to detect only very high relative risk estimates. Axelson et al. (1980) reported

increases in death due to stomach cancer based on 3 deaths among 348 Swedish railroad workers. Theiss et al. (1982) also found an excess stomach cancer mortality in 74 workers at a trichlorophenol manufacturing plant in West Germany.

These epidemiologic data do not specifically implicate TCDD or TCDF in the etiology of STS, malignant lymphomas, or stomach cancer. Therefore, epidemiological studies so far have provided only qualitative information on the possible human carcinogenicity of the dibenzodioxins and dibenzofurans.

Few positive associations between 2,4,5-T herbicide exposure and increases in birth defects have been reported (USEPA,1984). Most of these reports have been based on geographic correlation studies. The uncertainties in the epidemiological methods, as well as the difficulty in distinguishing the causative agents, has not allowed for a definitive correlation between PCDD exposure and human birth defects.

In addition to the other sources of human exposure, low levels of PCDDs and PCDFs have been detected in human breast milk (Rappe et al. 1984 a,b). The levels are normally in the parts per trillion range, and the less toxic octachlorinated dibenzodioxins and dibenzofurans are the predominant congeners. Human breast milk and adipose tissue exhibit comparable levels of PCDDs and PCDFs (approximately 500 ppt). These results demonstrate that PCDDs and PCDFs are readily bioaccumulated and suggest that breast feeding may by a source of infant exposure to PCDDs and PCDFs under the correct circumstances.

Laboratory Animal Investigations

The median lethal dose of TCDD has been investigated in several species of animals. There is from 5000 to 10,000-fold difference between the most sensitive species (guinea pig) and the least sensitive (hamster). 2,3,7,8-TCDD is the most potent congener in producing lethal and other toxic effects in animals. Studies on the acute effects of multiple or single exposure to TCDD in rats, mice, and guinea pigs, clearly suggest that a threshold dose exists for several toxicities including lethality, loss of body weight and thymic atrophy (USEPA, 1984: Moore et al. 1979).

Liver toxicity has been studied extensively and is a sensitive indicator of subchronic and chronic toxicity associated with the PCDDs and PCDFs. The induction of liver damage is species-specific as is the minimal effective dose or the no observable adverse effect level (NOAEL) for TCDD. TCDD and the PCDFs are extremely potent liver enzyme inducers and the ability of the respective isomer to induce cytochrome P_{450} enzymes correlates with the toxicity of the congener, the level of chlorination, the planarity of the molecule, and the ability of the compound to bind to a specific cytocellular receptor (Safe, 1986). Chronic administration of TCDD in laboratory animals may also produce hyperplasia of several epithelial tissues (e.g. epidermis,intestinal mucosa, urinary tract), dermatitis (chloracne), and other epidermal changes and necrosis or atrophy of several tissues or organs (Poland and Knutson, 1982). The effects of TCDD exposure on the immune system has been extensively reviewed (Vos, 1977; USEPA, 1984). Decreases in thymic and splenic weight have been observed in all animals exposed to high levels of TCDD.

TCDD is the most potent animal teratogen known, producing effects at doses as low as 1 $\mu g/kg/day$. Cleft palate and embryotoxicity can be induced in mice at 0.1 ppm, a level as it appears in the herbicide 2,4,5-T (Hart, 1984). TCDD induces a high percentage of cleft palate in mouse fetuses when administered during organogenesis (Pratt et al., 1984).

Chronic rodent bioassays to assess carcinogenicity of TCDD have indicated that 2,3,7,8-TCDD is the most potent of the congeners. The result of these assays have been extensively reviewed (IARC, 1977; Hart, 1984; USEPA, 1984; Kociba et al., 1984; CDHS, 1985; Smith, 1985). Several long-term animal studies determined that TCDD is a species-specific carcinogen. Two of these investigations have been utilized for quantitative risk assessment (Korciba et al. 1978, 1979; NTP 1980) and are summarized in detail in several reviews (USEPA, 1984; CDHS, 1985; Smith, 1985). In general, an increase in hepatocellular carcinomas and neoplastic nodules was observed in both mice and rats administered 2,3,7,8-TCDD orally in corn oil for two years. Other significant tumors occurred as squamous cell carcinoma of the lung, nasal turbinates, and subcutaneous tissue fibromas and fibrosarcomas, thyroid follicular cell adenomas, adrenal cortical adenomas and lymphomas. Tumor incidence in rats administered a mixture to two hexachlordibenzo-*p*-dioxins was increased for hepatocellular carcinomas, adenomas and preneoplastic nodules (NTP,1982).

The ability of TCDD to initiate cells has not been firmly established. TCDD does not form detectable covalent DNA adducts and is not mutagenic in several mutagenicity assays (USEPA,1984). TCDD promoted diethylnitrosamine-initiated hepatocellular tumors in rats given TCDD as a promoter in an initiation/promotion protocol (Pitot et al. 1980). In the two-stage mouse skin tumorigenesis system, no tumor-promoting activity could be attributed to TCDD in DMBA initiated mouse skin carcinogenicity assays utilizing CD-1 mice (Berry et al. 1978); however, TCDD promoted DMBA initiated skin tumors in the nr/nr mouse (Herbert et al., 1990). TCDD has also been demonstrated to act as a promoter with 3-methylcholanthrene in mice, presumably by inducing AHH activity in responsive mice (Kouri et al. 1978). Further research on the mechanism of TCDD in tumorigenesis indicates that the dioxins are capable of binding to specific nuclear proteins and activating promoter sequences which in turn switch on and off specific gene sequences (Whitlock, 1987). Based on animal data, the USEPA has classified TCDD and the dioxin congeners as probable human carcinogens (B2).

Environmental Fate and Transport

PCDDs and PCDFs are extremely stable to chemical action. The compounds are stable in the presence of strong mineral acids, alkalis and heat. Only after 15 minutes at 700 C is there 99 percent destruction of TCDD (Hart, 1984). PCDDs tend to photodecompose to produce less chlorinated species. Photoreductive dechlorination (loss of chlorine) of PCDDs will also occur in the presence of a hydrogen donor. TCDD is relatively resistant to biodegradation (USEPA, 1984).

PCDDs emitted to the atmosphere from combustion processes are often adsorbed to particulate matter emitted as fly ash. The degree of adsorption onto particulates may be a function of particle size and the chlorine substitution of the molecule (USEPA, 1984). TCDD appears to adsorb to larger particles of possible significance (3 to 10 μm) than do the more

heavily chlorinated dioxins. Photdegradation and wet and dry deposition of particulate-bound PCDDs are the most important transport and fate processes for the atmospheric PCDDs (USEPA,1984).

Under experimental conditions, the half-life of TCDD in water is approximately one year (NRCC, 1981; USEPA, 1984), although volatilization via air/water interface may account for greater loss of TCDD than biodegradation. In general, the greater the chlorine substitution of the dibenzodioxin, the more resistant the compound is towards biodegradation. In sediment-containing lake waters the half-life for TCDD was found to be 550 to 590 days (Hart, 1984).

PCDDs demonstrate a high affinity for soils, particularly those containing high organic matter. The soil/water partition coefficient for TCDD in soils is high, indicating that PCDDs may exhibit a greater affinity towards soils than water. Because of this property, and the low water solubility of the dioxins, PCDDs tend to remain near the surface of soils (NRCC, 1981; Hart, 1984). Vertical movement of PCDDs is negligible in soils with high organic material while migration is increased in soils as the organic material decreases. This process is further influenced by heavy rainfall, saturation of particulate binding sites in soil and human activity (e.g., excavation).Photodecomposition in soils is also negligible. TCDD is not likely to be metabolized readily by soil microbes since the compounds tend to sorb strongly to soil particles. The biodegradation half-life of TCDD in the soil is estimated to range from 1 to 12 years, depending of the soil constituents (Kimbrough, 1984).

2,4-DINITROPHENOL

Noncarcinogenic Effects

Numerous cases of human poisoning with 2,4-dinitrophenol (2,4-DNP) have been reported. Most exposures were associated with the use of 2,4-DNP as a component of explosives during World War I and as a weight reducing drug during the early 1930s (USEPA 1980). A lethal oral dose of 2,4-DNP for humans as low as 4.3 mg/kg has been reported. Effects of acute exposure include sudden pallor, burning thirst, agitation, dyspnea, profuse sweating, hyperpyrexia and death (Horner 1942). Symptoms associated with longer-term oral or inhalation exposure to 2,4-DNP include gastrointestinal disturbances, sweating, weakness, dizziness, headache and weight loss. Chronic oral exposure is associated with cataract formation at doses as low as 2 mg/kg-day (Horner 1942) and skin rashes (Tainter 1935).

Oral LD50s reported for laboratory animals range from 20 to 200 mg/kg in dogs, rats and rabbits (USEPA 1980). Longer-term studies in animals indicate that 2,4-DNP causes weight loss and damage to the spleen and testes. Embryotoxicity, but not teratogenicity, was also observed at doses causing maternal toxicity. No effects in rats were observed at doses below 5.4 mg/kg-day (Spencer et al. 1948).

The USEPA has calculated an oral chronic RfD for 2,4-DNP of 2E-3 mg/kg-day, based upon the report by Horner (1942) of cataract formation in humans at doses of 2,4-DNP as low as 2 mg/kg-day (USEPA 1990b). Confidence in the RfD is low, since the principal study provides only anecdotal data and the supporting data base is meager (USEPA 1990b).

USEPA has not derived subchronic RfD for 2,4-DNP. However, the chronic oral RfD was derived from information on subchronic exposures from Horner (1942), using an uncertainty factor that included a factor of 10 for extrapolation from subchronic to chronic duration (USEPA 1990b). On this basis, to evaluate subchronic effects of 2,4-DNP at the site, a subchronic RfD of 2E-2 mg/kg-day will be used. The USEPA has not derived inhalation RfDs for 2,4-DNP (USEPA 1990b).

Carcinogenic Effects

No chronic bioassays assessing the carcinogenic potential of 2,4-DNP were located. The results of shorter-term studies indicate that 2,4-DNP does not cause or promote tumor formation in mice (USEPA 1980). 2,4-DNP was reported to be mutagenic in one bacterial system (Demerec et al. 1951), but was not found to be mutagenic in mammalian cells (Friedman and Staub 1976, Swenberg et al. 1976). Mitra and Manna (1971) observed chromosome aberrations in mouse bone marrow cells following in vivo treatment with 2,4-DNP, but no linear dose-effect relationship was observed. The USEPA has not evaluated the carcinogenic potential of 2,4-DNP (USEPA 1990b).

2,4-DINITROTOLUENE

Noncarcinogenic Effects

In humans, inhalation and/or dermal exposure to 2,4-dinitrotoluene (2,4-DNT) in occupational settings has been associated with cyanosis, anemia, neurological symptoms, reduced sperm counts and increased mortality due to ischemic heart disease (ATSDR 1988a). The magnitude and duration of the exposures that led to these symptoms were generally not measured, so dose-response data are not available. No studies were located on health effects in animals following inhalation exposure to 2,4-DNT.

Oral administration of 2,4-DNT to several animal species results in adverse effects on the hepatic, renal, nervous, reproductive and hematopoietic systems (ATSDR 1988a). In a 24-month oral study (Ellis et al. 1979), hepatic lesions were observed in dogs and mice and hepatic dysplasia was observed in rats. In the same study, cystic degeneration and other serious renal effects were observed in mice at a dose of 97 mg/kg-day. Neurological effects ranging from central nervous system depression to paralysis in dogs, rats and mice were reported in subchronic and chronic studies (ATSDR 1988a).

Subchronic and chronic exposure to 2,4-DNT resulted in hematological changes, primarily anemia, in dogs, rats and mice (Lee et al. 1978, Ellis et al. 1979). Ellis et al. (1979) reported mild anemia in dogs administered 1.5 mg/kg-day 2,4-DNT, rats given 40 mg/kg-day and mice given 898 mg/kg-day for 24 months.

The USEPA has not calculated oral or inhalation RfDs for 2,4-DNT (USEPA 1990a). However, oral MRLs have been calculated (ATSDR 1988a). A subchronic oral MRL of 5E-2 mg/kg-day was derived from a NOAEL of 5 mg/kg-day for hematological effects in dogs in the study by Lee et al. (1978). A chronic oral MRL of 1E-3 was derived from the NOAEL of 0.2 mg/kg-day for hematological effects in dogs in the study by Ellis et al. (1979) (ATSDR 1988a).

Carcinogenic Effects

The carcinogenic potential of dinitrotoluenes has been studied in chronic bioassays and some less-than-lifetime studies. 2,4-DNT was moderately hepatocarcinogenic in rats and produced renal tumors in male mice (ATSDR 1988a). Ellis et al. (1979) reported statistically significant increases in renal tumors in male mice fed 97 mg/kg-day of 2,4-DNT (98% 2,4-DNT, 2% 2,6-DNT) for two years and in liver tumors in rats fed 40 mg/kg-day. Significant increases in subcutaneous tissue fibromas in male rats and mammary gland fibroadenomas in female rats were also observed. Based on this study, the USEPA classified both 2,4-DNT and 2,6-DNT in Group B2 (probable human carcinogen) and calculated an oral slope factor (SF) of 6.8E-1 $(mg/kg\text{-}day)^{-1}$ for a mixture of both isomers (USEPA 1990a).

TOLUENE

Toluene is produced both naturally and as a by-product of certain refining and manufacturing processes. The vast majority of toluene is used as a component of gasoline. Toluene is a clear, sweet-smelling liquid that can be found in crude oil and the Tolu tree. It can also be found as a by-product of styrene production, petroleum refining, and coke-oven operations. Toluene is also known as methylbenzene and phenylmethane and has a molecular weight of 92.15. Toluene is classified as a hazardous waste under the Resource Conservation and Recovery Act (ATSDR, 1989).

Acute Effects

Inhalation. Very few studies regarding the acute toxicity and lethality of toluene. Human data is limited to case studies of workers who have occupational exposure or case studies of abusers of solvents for recreational use. It is noted that either of the potential exposure pathways above may involve simultaneous exposure to a variety of compounds.

There have been no deaths attributed to toluene exposure in the United States, whereas 80 deaths per year are attributed to toluene associated with solvent abuse in Great Britain(Anderson et al, 1985). Signs and symptoms of exposure are primarily characteristic of central nervous system depression. High concentration exposure produces reversible depression of the central nervous system. Even acute exposure concentrations sufficient to produce unconsciousness are not observed to produce long-term organ damage.

Central nervous system depression is also the most typical adverse effect observed in animals. A few animal studies of inhalation exposure in rats and mice suggest that mice area more sensitive species than rats. LC50 values have been reported at 5, 320 ppm (920 PP mg/kg) in mice (Svirbely et al, 1943) and 8,800 ppm (365 mg/kg) in rats (Carpenter et al,1976).

Ingestion Dermal. No data regarding actual oral exposure in humans and very little in animals was found.

The potential for acute lethality of toluene in animals following ingestion has been investigated by a number of studies. The range of LD50s found was 5.5 to 7.3 g/kg. Some evidence suggests that age may play a role with juvenile rats the most sensitive (Kimura et al, 1971; Smyth et al, 1969; Withey and Hall, 1975; Wolf et al, 1956).

No data was located on the acute toxicity of toluene through dermal exposure in either humans or animals.

Systemic Effects

Respiratory Effects, Inhalation. Toluene is considered a respiratory irritant in both humans and animals. Occupationally exposed workers were observed to experience upper respiratory irritation at concentrations of 200 to 800 ppm of toluene over the course of several years (Parmeggiani and Sassi, 1954). A study by von Oettingen et al (1942)

Toluene reported no irritant effects in volunteers exposed to 800 ppm for 7 to 8 hours. Most other human data is occupational with confounding exposure to other solvents that proves the data to be equivocal.

Animal data also provides data on the upper respiratory effects of toluene. Effects in rats range from upper airway irritation (600 ppm) to pulmonary lesions (2,500 ppm and 5,000 ppm) (von Oettingen et al, 1942). A study by Bruckner and Peterson (1981b) which is considered comprehensive and well conducted reported no irritation or histologic changes of the respiratory tract at concentrations up to 12,000 ppm in rats and mice. No explanation was cited for the difference in results between the studies cited above.

The 1980 study by CIIT observed no histopathological changes attributable to toluene at a concentration of 300 ppm in rats. Concentrations of 600 ppm to 1,200 ppm produced inflammation of the nasal mucosa and degeneration of the epithelium in the 1989 study by NTP.

Ingestion/Dermal. Toluene is not considered toxic to the respiratory system through either ingestion or dermal exposure.

Cardiovascular Effects, Inhalation. Most deaths in Great Britain of solvent abusers are attributed to arrhythmia; however, toluene does not seem directly toxic to the cardiovascular system as to produce lesions or other histopathological effects. No histopathological lesions of the heart were observed in rats at concentrations up to 12,000 ppm for 8 weeks and 1,200 ppm for 24 months (Bruckner and Peterson, 1981b; CIIT, 1980; NTP, 1989). A no observed adverse effect level *(NOAEL) of 1,200 ppm for chronic non-neoplastic* cardiovascular effects based on the NTP (1989) study.

Ingestion/Dermal. The NTP (1989) also exposed rats to toluene through ingestion. Findings included and increase in heart weight in rats at 1,250 mg/kg/day for 13 weeks and myocardial degeneration in mice at 5,000 mg/kg/day for 13 weeks.

No oral exposure in humans or dermal exposure in animals or humans is reported regarding cardiovascular toxicity.

Gastrointestinal Effects, Inhalation. The NTP (1989) study reported slight but not significant increase in stomach ulcers in rats after 2 years exposure to concentrations up to 1,200 ppm of toluene.

Ingestion/Dermal. No adverse gastrointestinal effects were observed at exposure concentrations up to 5,000 mg/kg/day of toluene for 13 weeks (NTP 1989).

No studies were found regarding cardiovascular effects of toluene following dermal exposure in animals or humans.

Hematologic Effects, Inhalation. Hematological effects once associated with toluene in occupational exposures have since been re-evaluated and partially attributed to exposure to other compounds historically found as contaminants of toluene in the workplace such as

benzene (Greenburg et al, 1942; Wilson, 1943; EPA, 1985c). The most recent studies have for the most part been negative with the only potential adverse effect being a reversible decrease in blood leukocytes. Exposure concentrations of toluene (with benzene <0.01%) ranged from 20 to 200 ppm in the studies by Tahti et al (1981), Banfer (1961) and Capellini and Alessio (1971). The results of Tahti et al (1981) are considered neither conclusive nor completely invalid due to possible confounding exposure to other solvents and limited cohort size.

The USEPAs Integrated Risk Information System (IRIS, 1989) and the Health Effects Assessment Summary Tables (HEAST, 1989) report the Reference Dose (RFD) for toluene to be 3E-1 mg/kg/day based on hematological effects (IRIS, 1989) as well as central nervous system effects and eye and nose irritation (HEAST, 1989) as based on data reported in several studies by Anderson et al (1983) and CIIT (1980). The study conducted by CIIT (1980) exposed rat to concentrations of toluene of 30, 100, and 300 ppm for 6 hours/day, 5 days/week for 24 months. The only dose-related effect observed was reduce hematocrit values in females in the 100 and 300 ppm groups. A NOAEL based on 300 ppm was derived to be 1,130 mg/m3.

Ingestion/Dermal. No data found.

Musculoskeletal Effects, Inhalation. No data of musculoskeletal effects in humans follow inhalation exposure to toluene were found.

No adverse musculoskeletal effects were reported by the NTP (1989) study in mice and rats exposed to dosage levels up to 1,200 ppm of toluene for two years through inhalation. Similar results were reported by the NTP (1989) study following oral exposure at dosage levels up to 5,000 mg/kg/day.

Ingestion/Dermal. No studies found.

Hepatic Effects, Inhalation. The liver is not considered to be a primary target organ following toluene exposure. This is thought to be due to the extensive metabolism of toluene by the liver to possibly more nontoxic metabolites. Studies by Seiji et al (1987) and Lundberg and Hakansson (1985) found no significant hapatic effects attributable to toluene exposure.

Toxic hepatic effects in animals are limited to increases and decreases in liver weight with no significant changes in what is considered serious parameters of liver toxicity. A lowest observed adverse effect level (LOAEL) of 800 ppm for 7 days in rats, mice, and rabbits is reported based on data gathered by Ungvary et al (1982). Increased liver weights were observed by the same study at longer exposure times (3 weeks) at 800 ppm, whereas Bruckner and Peterson (1981b) reported decreased liver weights in rats at a concentration of toluene of 12,000 ppm for eight weeks. The 1989 study by NTP also reported increased liver weights in rats exposed to 1,250 ppm for 15 week.

Ingestion/Dermal. No data regarding ingestion exposure in humans or animals or dermal exposure in humans was located. Only one inconclusive study in animals following dermal exposure was found.

Renal Effects, Inhalation. The majority of the qualitative human data regarding adverse kidney effects through inhalation exposure comes from case studies of solvent abusers. Most effects on the kidneys could possibly be associated with exposure to other solvents so only limited if any conclusions can be drawn. However, the kidney does not appear to be a primary target organ of toluene in humans.

The most recent studies in animals observe no adverse histopathological changes in the kidneys of rats and mice at concentrations up to 12,000 ppm for eight weeks (Bruckner and Peterson, 1981b) or concentrations up to 1,250 ppm for 15 weeks (NTP, 1989). The NTP (1989) study did however report an increase in liver weight at the exposure concentration and duration cited above. The NTP (1989) study reported nephropathy an observed in tabular cysts at doses of 600 to 1,200 ppm. The conclusion that the renal tubular cysts are adose-related effect is backed up by the CIIT (1980) study which observed no such cysts at 300 ppm for 24 months.

Ingestion/Dermal. No studies were located regarding the ingestion or dermal exposure in humans or dermal exposure in humans. Again, only one study considered in conclusive was found of dermal exposure to toluene in animals and any associated renal effect.

Dermal/Ocular Effects, Inhalation/Ingestion. No studies found.

Dermal. Dermal exposure to toluene may cause skin damage. Some workers experiencing long-term exposure report unspecified abnormal skin conditions of the hands (Winchester and Madjar, 1986).

Testing of dermal/ocular irritation in animals proves toluene to be a moderate skin and eye irritant (Kronevi et al, 1979; Hazelton Laboratories, 1962; Carpenter and Smyth, 1946).

Neurological Effects, Inhalation. Central nervous system (CNS) effects following exposure to toluene through inhalation seems to be the primary effect in humans. Human volunteers exposed to 40 ppm did not experience significantly changed CNS response(Anderson et al, 1983). Exposure to moderate concentrations (200 to 800 ppm) produced CNS excitatory effects followed by narcosis. The development of CNS depression is reported to increase with increased exposure concentration and duration (EPA, 1985c; von Oettingen et al, 1942). Exposure to sufficiently high concentrations can depress the CNS to the point of death. High concentrations can also produce symptoms such as tremors,ataxia, speech, hearing and vision impairment, and intellectual and neuromuscular effects (Devathasan et al, 1984; King et al, 1981; Suzuki et al, 1983; Iregren, 1986; Hanninen etal, 1976).

The reported effects in humans are supported by animal studies. Bruckner and Peterson(1981a) observed a correlation between CNS depression and toluene levels in the brain. Hartmann et al (1984) studied toluene exposure in monkeys and found impairment of

both cognitive performance and motor abilities at concentrations below those which cause more severe CNS effects such as tremors and ataxia.

Honma et al (1982) reported changes in brain neurotransmitter levels in rodents following exposure to 4,000 ppm. Ikeda et al (1986) and Arito et al (1985) observed similar results at 400 ppm for 30 days.

Changes in brain morphology were reported by Kyrklund et al (1987) following exposure 2 to 320 pm for 30 days. In contrast, NTP (1989) did not report any microscopic changes in morphology at 1,200 ppm for two years. The NTP (1989) study did however report an increase in brain weight in rats and mice.

Toluene is also considered to produce changes in the auditory system. The 1984 (a,b)studies by Pryor et al considered 700 and 1,000 ppm to be the threshold for hearing loss in rats. Hearing loss was permanent in the high-frequency range.

Ingestion/Dermal. The 1989 study by NTP reported an increase in brain weight after oral exposure to 1,250 mg/kg/day of toluene for 13 weeks in rats.

Immunological Effects, Inhalation. Slight immunological effects in humans is thought to possibly be associated with the decrease in leukocytes in humans and animals. No definite data has been found to support this theory (Moszcynski and Lisiewicz, 1984;ATSDR, 1989).

Toluene exposure at concentrations of 2.5 to 500 ppm have been associated with an increased potential for upper respiratory *infections (*Arany et al, *1985; Suleiman, 1987*).

Ingestion/Dermal. No studies found.

Developmental Effects

Inhalation. Toluene has been shown to produce adverse developmental effects in both humans and animals. Solvent abuse in pregnant women produced CNS dysfunction, limb anomalies and growth retardation in case studies of eight women. There is a great probability of confounding exposures to other solvents so limited conclusions can be drawn from these case studies (Holmberg, 1979; Goodwin et al, 1988).

Studies in animals have provided quantitative evidence for the developmental toxicity of toluene. A study by Courtney et al (1986) reported reproductive and fetal changes at exposure concentrations of 200 and 400 ppm. Based on these data a LOAEL of 200 ppm is indicated in mice.

Studies by Ungvary and Tatrai (1985) in mice and rabbits and Unguary (1985) in rats also provide evidence of developmental toxicity at moderate concentrations (100 to 400 ppm). ALOAEL of 267 ppm is reported for developmental effects in rats and rabbits.

Ingestion/Dermal

Toluene was not reported as a developmental toxicant following oral exposure by Seidenberg et al (1986) and Smith (1983). The LOAEL for developmental effects due to oral exposure is 2,350 mg/kg/day based on the study by Smith (1983).

Reproductive Effects

Inhalation. Data gathered from animals studies did not indicate toluene to be a· reproductive toxicant. Exposure concentrations up to 2,000 ppm in mice showed no treatment-related reproductive or survival effects (API, 1981 and 1985). Rats exposed to 300 ppm for 24 months produced no histopathological changes of the testes or ovaries attributable to toluene exposure (CIIT, 1980).

Ingestion/Dermal. The study by Smith (1983) reported no effect on viable litter· production after 2,350 mg/kg/day administered orally.

Genotoxic Effects

Inhalation. Available data, though inconclusive, suggests that toluene is not a human or (animal genotoxic agent. Some case studies of occupationally exposed workers reported an increase in sister chromated exchange (Schmid et al, 1985; Bauchinger et al, 1982). The importance of these findings in regard to the severity of genotoxic toxicity is not known. Other studies have found no correlation between occupational toluene exposure and changes in chromosomes or sister chromatic exchange (Haglund et al, 1980; Maki-Paakkanen et al,1980).

The only study found regarding genotoxic toxicity due to inhalation exposure in animals reported no induction of dominant lethal mutations in sperm cells of male mice (API, 1981).

Ingestion/Dermal No studies found.

CARCINOGENIC EFFECTS

Inhalation. No available data suggest that toluene is a cancer causing agent due to inhalation exposure. In fact, on retrospective cohort mortality study of oil refinery workers exposed to toluene as well as other chemicals indicated a rate of cancer deaths for the 1,008 male workers involved lower than that of the general population. The study did identify an apparent though not significantly significant association between the incidence of cancer and the duration of exposure (Wen et al, 1985). Limited confidence in the study is noted due to lack of historical monitoring and insufficient size of study population to detect small increases in the incidence of cancer.

No study in rats or mice produced an increased incidence of cancer at concentrations up to 1,200 ppm for two years (CIIT, 1980; NTP, 1989). Some limitations are noted regarding the CIIT (1980) study due to the fact that animals were thought to have been able to withstand higher dosing concentrations.

Ingestion/Dermal. Dermal exposure of toluene in mice was investigated by Weiss et al (1986). Increased inhibition of skin tumorigenesis in conjunction with the use of apromoter. Toluene is postulated to interfere through competition with the promoter compound receptor site or interferences with biological cell processes.

HMX

Noncarcinogenic Effects

In humans, HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine) has been reported to cause skin irritation by direct application, but no other adverse effects were observed during possible occupational exposure (USEPA 1988b). HMX is poorly absorbed from the gastrointestinal tract of laboratory animals (USEPA 1988b); about 70% of the original dose is recovered unmetabolized in the feces. The AF_o for HMX is assumed to be 0.30. Toxic effects are observed only at relatively high doses; the oral LD_{50} values range from 2,300 mg/kg in rats to 6,300 mg/kg in mice (USEPA 1988b).

Adverse effects to the liver and kidneys were observed in rats and central nervous system effects and increased mortality were reported in mice following subchronic oral exposure to HMX (USEPA 1988b). Central nervous system effects (hyperkinesia and excitability) were observed in mice given doses as low as 100 mg/kg-day in the diet for 14 days (Greenough and McDonald 1985) and increased mortality was reported at higher doses.

It appears that the target organ response of rats to HMX is sex-specific. Everett et al. (1985) reported liver lesions in male rats and kidney lesions in female rats following administration of HMX in the diet for 13 weeks at doses of 150 mg/kg-day and 270 mg/kg-day, respectively. No adverse effects were reported in males given 50 mg/kg-day or in females given 115 mg/kg-day. Based on the NOAEL of 50 mg/kg-day in male rats, the USEPA calculated a chronic oral RfD of 5E-2 mg/kg-day (USEPA 1990b). The confidence rating of the RfD is low, since interpretation of some data from the principal study was difficult, some endpoints were not evaluated at lower doses and no long-term studies or studies on reproductive effects or developmental toxicity were available (USEPA 1990b). USEPA did not consider available data adequate to calculate an inhalation RfD (USEPA 1990b).

USEPA has not derived a subchronic RfD for HMX. However, the chronic oral RfD was derived from the 13-week study of Everett et al. (1985), with an uncertainty factor that included a factor of 10 for extrapolation from subchronic to chronic duration (USEPA 1990b). On this basis, to evaluate subchronic effects of HMX at the site, a subchronic RfD of 5E-1 mg/kg-day will be used.

Carcinogenic Effects

No studies were located on the carcinogenicity of HMX to any species by any route of exposure. HMX was found not to be mutagenic in several microbial systems (USEPA 1988b). Gene mutation assays in several strains of Salmonella tyertainty factor that included a factor of 10 for extrapolation from subchronic to chronic duration (USEPA 1990b). On this basis, to evaluate subchronic effects of HMX at the site, a subchronic RfD of 5E-1 mg/kg-day will be used.

Carcinogenic Effects

No studies were located on the carcinogenicity of HMX to any species by any route of exposure. HMX was found not to be mutagenic in several microbial systems (USEPA 1988b). Gene mutation assays in several strains of Salmonella typhimurium were negative (Simmon et al. 1977, Stilwell et al., 1977, Whong et al. 1980) and a mitotic gene conversion assay in Saccharomyces cerevisiae was also negative (Simmon et al. 1977). However, these results are considered inconclusive because of the low concentrations assayed or the lack of data in the reports (USEPA 1988b). Based on the lack of epidemiological studies or cancer bioassays, the USEPA has classified HMX in Group D (not classifiable as to human carcinogenicity) (USEPA 1990b).

RDX

Noncarcinogenic Effects

Occupational exposure (primarily by inhalation) to RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine) is associated with central nervous system effects, including insomnia, irritability, amnesia, headache, nausea, convulsions and unconsciousness. Accidental ingestion of RDX by humans has caused similar central nervous system effects (USEPA 1988a).

Adverse effects following subchronic and chronic oral administration of RDX to laboratory animals include central nervous system symptoms, increased mortality, weight loss, anemia, hepatotoxicity, renal toxicity, testicular degeneration and inflammation of the prostate (USEPA 1988a). Cholakis et al. (1980) reported anemia in male mice and rats following oral administration of RDX at doses of 160 mg/kg-day and 28 mg/kg-day, respectively, for 90 days. Increased liver weights were reported in both species at higher doses. Vomiting and central nervous system disturbances were reported in monkeys given oral doses of RDX of 10 mg/kg-day for 90 days (Martin and Hart 1974).

In a chronic study in mice, Lish et al. (1984) observed testicular degeneration at a dose of 35 mg/kg-day, increased liver weights at 100 mg/kg-day and increased mortality at 175 mg/kg-day. Developmental toxicity resulting from RDX ingestion has also been reported in rats and rabbits at doses of 16 mg/kg-day and 20 mg/kg-day, respectively (USEPA 1988a).

Levine et al. (1983a) administered RDX in the diet to Fisher 344 rats at doses of 0.3, 1.5, 8.0 or 40 mg/kg-day for two years. They observed anemia, increased mortality, liver enlargement and kidney enlargement accompanied by histologic changes at the 40 mg/kg-day dose level. Inflammation of the prostate was reported at a dose of 1.5 mg/kg-day. No adverse effects were observed at the lowest dose level (0.3 mg/kg-day). Based on the NOAEL of 0.3 mg/kg-day from this study, USEPA calculated chronic and subchronic oral RfDs of 3E-3 mg/kg-day (USEPA 1990a, 1990b). The confidence level of the RfDs is rated high, based on a well-executed, long-term study with a clear NOEL and LOAEL and an extensive supporting database (USEPA 1990b). USEPA did not consider available data adequate to calculate an inhalation RfD (USEPA 1990b).

Carcinogenic Effects

RDX was not found to be carcinogenic to two strains of rats following oral administration of up to 10 mg/kg-day and 40 mg/kg-day for two years (Hart 1977, Levine et al. 1983a). However, statistically significant increases of hepatocellular carcinomas and adenomas (combined) were reported in female mice fed RDX at doses of 7 mg/kg-day and greater for two years (Lish et al. 1984). A nonsignificant increase in alveolar and bronchiolar carcinomas and a slight increase in malignant lymphoma of the kidney were also observed. Based on these studies, the USEPA has classified RDX in Group C (possible human carcinogen) by inhalation and oral routes of exposure (USEPA 1988a), and calculated an oral slope factor (SF) of 1.1E-1 $(mg/kg\text{-}day)^{-1}$ based on the incidence of liver tumors in mice (USEPA 1990a). USEPA did not consider available data adequate to calculate an inhalation SF (USEPA 1990b).

TETRYL

Noncarcinogenic Effects

Occupational (inhalation/dermal) exposure to tetryl (2,4,6-trinitrophenyl methyl nitramine) reportedly causes dermatitis, dermal sensitization, respiratory tract irritation and gastrointestinal symptoms at air concentrations not exceeding 1.5 mg/m^3 (ACGIH 1986). Other effects following heavy exposure included yellow pigmentation of the skin and possible liver, hematopoietic and neurological damage.

Reported effects of acute administration of tetryl to laboratory animals, observed during histopathological tissue examination following fatal doses, included toxic degeneration of the kidneys, varying degrees of liver necrosis and edema of the lungs and bronchi (ACGIH 1986). The smallest fatal dose of tetryl was 500 mg/kg administered subcutaneously in olive oil to a dog.

No studies were located on subchronic or chronic oral or inhalation exposure to tetryl. Therefore, data were unavailable for calculation of any RfD values for tetryl (USEPA 1990b).

Carcinogenic Effects

No studies were located on the carcinogenicity of tetryl to any species by any route of exposure. Tetryl was reported to be mutagenic in Salmonella typhimurium strains TA 1535, TA 1537, TA 98 and TA 100 with and without metabolic activation (McGregor et al. 1980). Whong et al. (1980) also reported tetryl to be mutagenic in three microbial test systems.

USEPA has not classified the carcinogenicity of tetryl and has not calculated a slope factor for tetryl (USEPA 1990b).

1,3,5-TRINITROBENZENE

Noncarcinogenic Effects

No information on the subchronic or chronic toxicity of 1,3,5-trinitrobenzene (1,3,5-TNB) to humans or laboratory animals by inhalation or oral exposure is available (USEPA 1989e). Acute oral LD_{50} values range from 450 mg/kg to 730 mg/kg in mice, rats and guinea pigs (USEPA 1989e). Reported acute toxic effects included central nervous system and respiratory disorders and cyanosis. A single oral or intraperitoneal dose of 1,3,5-TNB was reported to increase blood levels of methemoglobin in rats (Senczuk et al. 1976, Watanabe et al. 1976). Korolev et al. (1977) administered 1,3,5-TNB orally to rats, mice and guinea pigs and observed adverse effects to the central nervous system, blood and liver. No further details on doses, duration or toxicity were available (USEPA 1990b).

Since insufficient data are available for 1,3,5-TNB, the USEPA has calculated chronic and subchronic oral RfDs for 1,3,5-TNB based on its structural and toxicological similarity to 1,3-dinitrobenzene (1,3-DNB), (USEPA 1989e, 1990b. This is considered appropriate since the oral LD_{50} for 1,3-DNB in the rat is 83 mg/kg, considerably lower than the corresponding value for 1,3,5-TNB, 450 mg/kg, and both 1,3-DNB and 1,3,5-TNB were reported to cause similar increases in blood levels of methemoglobin in rats (USEPA 1989e, 1990b). Cody et al. (1981) administered 1,3-DNB in drinking water to rats at doses of 0, 3, 8, or 20 ppm for 16 weeks. Increases in spleen weight were detected at the 8 ppm dose level but not at 3 ppm. Based on this NOAEL (converted to 0.51 mg 1,3,5-TNB/kg-day), the USEPA calculated a chronic oral RfD of 5E-5 mg/kg-day (USEPA 1990b) and a subchronic oral RfD of 5E-4 mg/kg-day (USEPA 1990a). The confidence in the RfD is rated as low due to the lack of toxicological or pharmacokinetic data on 1,3,5-TNB (USEPA 1990b). The USEPA has not derived any inhalation RfDs for 1,3,5-TNB (USEPA 1990b).

Carcinogenic Effects

No information is available on the carcinogenicity of 1,3,5-TNB to humans or laboratory animals by inhalation or oral exposure (USEPA 1989e). Slaga et al. (1985) administered 1,3,5-TNB by intraperitoneal injection three times/week for eight weeks to mice at doses of 600, 1,500 or 3,000 mg/kg and reported that no lung tumors were observed. These authors also reported that single topical applications of 1,3,5-TNB to mouse skin caused inflammation, epidermal hyperplasia and cell darkening, but that no skin tumors were observed. The results of this study were judged to be inconclusive by USEPA (1989e) because (1) benzo(a)pyrene, a known carcinogen included as a positive control, did not produce lung tumors either and (2) direct tests of the potential of 1,3,5-TNB to promote mouse skin tumors in the presence of a known initiator were not conducted. 1,3,5-TNB was reported to be mutagenic with and without metabolic activation in bacterial assays (USEPA 1989e). The USEPA has classified 1,3,5-TNB in Group D (not classifiable as to human carcinogenicity) due to insufficient data (USEPA 1989e).

2,4,6-TRINITROTOLUENE

Noncarcinogenic Effects

In humans, occupational exposure (primarily inhalation and dermal) to 2,4,6-trinitrotoluene (2,4,6-TNT) has been reported to initially produce relatively mild effects such as respiratory irritation, skin lesions and gastrointestinal disorders and more severe symptoms such as methemoglobinemia, jaundice, aplastic anemia, cataract formation, menstrual disorders, neurological dysfunction and nephrotoxicity following prolonged exposure or exposure to high concentrations (Zakhari and Villaume 1978). Of these disorders, the most consistently observed are hepatitis and aplastic anemia (Zakhari and Villaume 1978).

Acute oral LD_{50} values ranging from 500 to 1,850 mg/kg have been reported in several animal species. Toxic signs following acute administration include lassitude, cyanosis, occasional muscular twitching, convulsions and discolored urine. When applied to the skin of rabbits, 2,4,6-TNT produced mild dermal irritation (NIOSH 1988). About 60% of 2,4,6-TNT is absorbed through the gastrointestinal tract (USEPA 1989f), so AF_o for 2,4,6-TNT is assumed to be 0.60.

In animals, significant and consistent findings following oral administration of 2,4,6-TNT include hemolytic anemia with compensatory responses such as reticulocytosis, methemoglobinemia and increased spleen weight usually associated with hemosiderosis. In lifetime studies, the most consistent signs are congestion and extramedullary hematopoiesis, increased liver weight associated with hyperplasia and hepatocytomegaly (Dilley et al. 1978, Levine et al. 1981, 1983b, Furedi et al. 1984a,b). Testicular atrophy and hyperplasia have been observed in rats treated with 160 mg/kg-day of 2,4,6-TNT for up to 13 weeks (Dilley et al. 1978) and similar effects were seen in rats fed 125 to 300 mg/kg-day in the diet (Levine et al. 1981).

Based on an evaluation of these studies, USEPA concluded that dogs are somewhat more sensitive to the hepatic effects of 2,4,6-TNT than either mice or rats. In a 26-week study in dogs, 2 mg/kg-day TNT administered by capsule produced clearly toxic effects to the liver, spleen and hematopoietic system (Levine et al. 1983b), while 0.5 mg/kg-day produced mild effects on the liver (hepatocytomegalia with hepatocytic cloudy swelling). Based on the LOAEL of 0.5 mg/kg-day from this study, and supporting studies in mice and rats (Furedi et al. 1984a,b), the USEPA calculated a chronic oral RfD of 5E-4 mg/kg-day (USEPA 1990b). Confidence in the RfD is rated medium (USEPA 1990b), since the principal study was well-designed, but the method of administration (capsule) is not ideal and a NOAEL was not established. USEPA did not consider available data adequate to calculate an inhalation RfD (USEPA 1990b).

USEPA has not derived subchronic RfD for 2,4,6-TNT. However, the chronic oral RfD was derived from the 26-week study of Levine et al. (1983b), with an uncertainty factor that included a factor of 10 for extrapolation from subchronic to chronic duration (USEPA 1990b). On this basis, to evaluate subchronic effects of 2,4,6-TNT at the site, a subchronic RfD of 5E-3 mg/kg-day will be used.

Carcinogenic Effects

No data are available on the carcinogenic effects of 2,4,6-TNT in humans. The carcinogenic potential of 2,4,6-TNT was evaluated in 24-month studies in Fischer 344 rats and in hybrid B6C3Fl mice (Furedi et al. 1984a,b). In the rat study, the animals were administered 0, 0.4, 2, 10 or 50 mg/kg-day of 2,4,6-TNT in the diet. In female rats, treatment produced an increase in the incidence and severity of hyperplastic, preneoplastic and neoplastic lesions of the mucosal epithelium of the urinary bladder. In the mouse study, the animals were administered 0, 1.5, 10 or 70 mg/kg-day of 2,4,6-TNT. Microscopic examination of the spleens revealed an increase in the incidence of leukemia and malignant lymphoma in the high-dose female mice which was not considered to be statistically significant (USEPA 1989f).

2,4,6-Trinitrotoluene was strongly mutagenic to Salmonella typhimurium strains TA-98, TA-1538 and TA-1537 with or without metabolic activation, indicating it is a frameshift mutagen (Ellis et al. 1980). Similar results were reported by Dilley et al. (1978).

Based on the occurrence of urinary bladder tumors in female rats and the supporting evidence of carcinogenicity provided by the mutagenic activity in Salmonella, USEPA has classified 2,4,6-TNT in group C (possible human carcinogen) and has calculated an oral slope factor (SF) of 3.0E-2 $(mg/kg\text{-}day)^{-1}$ (USEPA 1990b). USEPA did not consider available data adequate to calculate an inhalation SF (USEPA 1990b).

ARSENIC REFERENCES

ACGIH. 1986. American Conference of Governmental Industrial Hygienists. Documentation of the threshold limit values and biological exposure indices, 5th ed. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.

Anke M, Grun M, Partschefeld M, Groppel B, Hennig A. 1978. Essentiality and function of arsenic. In: Kirchgessner M, ed. Trace element metabolism in man and animals, Vol. 3. Munich, West Germany: Freising-Weihenstephen Tech. University, 248-252.

Anke M, Krause U, Groppel D. 1987. The essentiality of arsenic. In: Hemphill DD, ed. Trace substances in environmental health. Columbia, MO: University of Missouri.

ATSDR. 1989. Agency for Toxic Substances and Disease Registry. Toxicological profile for arsenic. Atlanta, GA: Agency for Toxic Substances and Disease Registry.

Blom S, Lagerkvist B, Linderholm H. 1985. Arsenic exposure to smelter workers. Clinical and neurophysiological studies. Scand. J. Work Environ. Health 11:265-269.

Cebrian ME, Albores A, Aguilar M, Blakely E. 1983. Chronic arsenic poisoning in the north of Mexico. Human Toxicol. 2:121-133.

Chen CJ, Kuo TL, Wu MM. 1988a. Arsenic and cancers. Lancet I(575/6):414-415.

Chen CJ, Wu MM, Lee SS, et al. 1988b. Atherogenicity and carcinogenicity of high-arsenic artesian well water. Multiple risk factors and related malignant neoplasms of blackfoot disease. Arteriosclerosis 8:452-460.

Chen CJ, Chuang YC, You SL, Lin TM, Wu HY. 1986. A retrospective study on malignant neoplasms of bladder, lung and liver in blackfoot disease endemic area in Taiwan. Br. J. Cancer 53:399-405.

Chen CJ, Chuang YC, Lin TM, Wu HY. 1985. Malignant neoplasms among residents of a blackfoot disease-endemic area in Taiwan: high arsenic artesian well water and cancers. Cancer Res. 45:5895-5899.

Enterline PE, Marsh GM. 1982. Mortality among workers exposed to arsenic and other substances in a copper smelter. Am. J. Epidemiol. 116:895-910.

Hindmarsh JT, McCurdy RF. 1986. Clinical and environmental aspects of arsenic toxicity. CRC Crit. Rev. Clin. Lab. Sci. 23:315-347.

Lee AM, Fraumemi JF Jr. 1969. Arsenic and respiratory cancer in man: An occupational study. J. Natl. Cancer Inst. 42:1045-1052.

Lee-Feldstein A. 1983. Arsenic and respiratory cancer in man: follow up of an occupational study. In: Lederer W, Fensterheim R, ed. Arsenic: industrial, biomedial and environmental perspectives. New York, NY: Van Nostrand Reinhold.

Loehr RC, Upton A, Carlson GP. 1989. Letter and attached report from Science Advisory Board to William K. Reilly (Administrator), dated September 28, 1989. EPA-SAB-ECH-89-038.

Ott MG, Holder BB, Gordon HI. 1974. Respiratory cancer and occupational exposure to arsenicals. Arch. Env. Health 29:250-255.

Perry K, Bowler RG, Buckell HM, Druett HA, Schilling RSF. 1948. Studies in the incidence of cancer in a factory handling inorganic compounds of arsenic--II: clinical and environmental investigations. Br. J. Ind. Med. 5:6-15.

Pinto SS, McGill CM. 1953. Arsenic trioxide exposure in industry. Ind. Med. Surg. 22:281-287.

Schwartz K. 1977. Essentiality versus toxicity of metals. In: Brown SS, ed. Clinical chemistry and chemical toxicology of metals, Vol. 1. Amsterdam, The Netherlands: Elsevier, pp. 3-22.

Solomons NW. 1984. The other trace minerals. Manganese, molybdeneum, vanadium, nickel, silicon and arsenic. In: Nutrition and disease. Absorption and malabsorption of mineral nutrients. New York: Alan R. Liss, Inc. pp. 269-296.

Tseng WP. 1977. Effects and dose-response relationships of skin cancer and blackfoot disease with arsenic. Environ. Health Perspect. 19:109-119.

Tseng WP, Chu HM, How SW, et al. 1968. Prevalence of skin cancer in an endemic area of chronic arsenism in Taiwan. J. Natl. Cancer Inst. 40:453-463.

USEPA. 1990a. U.S. Environmental Protection Agency. Health effects assessment summary tables. First/Second quarters FY1990. Washington, DC: OERR 9200.6-303-(90-1/2).

USEPA. 1984. U.S. Environmental Protection Agency. Office of Health and Environmental Assessment. Health assessment document for inorganic arsenic. Final report. Research Triangle Park, NC: U.S. Environmental Protection Agency. EPA 600/8-83-021F.

Uthus E, Cornatzer W, Nielsen F. 1983. Consequences of arsenic deprivation in laboratory animals, In: Lederer W, Fensterheim R, eds. Arsenic: industrial, biomedical and environmental perspectives. New York: Van Nostrand Reinhold.

CHROMIUM REFERENCES

Ivankovic, S., and Preussman, R., 1975. Absence of toxic and carcinogenic effects after administration of high doses of chromic oxide pigment in subacute and long-term feeding experiments in rats. Food Cosmet. Toxicol; 13:347-351.

Langard, S. and Norseth T., 1975. A cohort study of bronchial carcinomas in workers producing chromate pigments. British Journal of Industrial Medicine; 32:62-65.

Mali, J.W.H., Vankooten, W.J., and VanNeer, F.C.J., 1963. Some aspects of the behavior of chromium compounds in the skin. Journal Investigative Dermatology; 41:111-22.

Mancuso, T.F., 1975. International Conference on Heavy Metals in the Environment. Toronto, Ontario, Canada.

U.S. Environmental Protection Agency (U.S. EPA 1984a). Health Assessment Document for Chromium. EPA-600/8-83-014F. Research Triangle Park.

U.S. Environmental Protection Agency (U.S. EPA 1984b). Health Effects Assessment for Hexavalent Chromium-Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office. Cincinnati, OH.

U.S. Environmental Protection Agency (U.S. EPA 1984c). Health Effects Assessment for Trivalent Chromium. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office. Cincinnati, OH.

LEAD REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). 1988. Toxicological Profile for Lead. Oak Ridge National Laboratory, TN.

Azar, A,Trochimowicz, HJ, Maxfield, ME. 1973. Review of Lead Studies in Animals Carried Out at Haskell Laboratory: Two Year Feeding Study and Response to Hemorrhage Study. In: Barth, A, Engal, R, Recht, P, Smeets, J, eds. Environmental Health Aspects of Lead: Proceedings, International Symposium, October 1972, Amsterdam, The Netherlands. Luxembourg: Commission of the European Communities; 199-210.

Cooper, WC and Gaffey, WR. 1975. Mortality of Lead Workers. J Occup Med; 17: 100-107

Cooper, WC. 1985. Mortality Among Employees of Lead Battery Plants and Lead Producing plants, 1947-1980. Scand J Work Environ Health; 11: 331-345.

Dingwall-Fordyce, I and Lane, RE. 1963. A Follow-up Study of Lead Workers. Br J Ind Med; 20:313-315.

Kasprzak, KS, Hoover, KL, Poirier, LA. 1985. Effects of Dietary Calcium Acetate on Lead Sebacetate Carcinogenicity in Kidneys of Male Aprague-Dawlry Rats. Carcinogenesis. 6(2): 279-282.

Koller, LO, Kerkvliet, NI, Exon, JH. 1985. Neoplasia Induced in Male Rats Fed Lead Acetate, Ethylurea and Sodium Nitrate. Toxicologic Pathol; 13: 50-57.

Nelson, BJ, Kiremidjian-Schumacher, L, Stotzky, JH. 1985. Effects of Cadmium, Lead,and Zinc on Macrophage-mediated Cytotoxicity Toward Tumor Cells. Environ Res. 23:154-163.

Selevan, SG, Landrigan, PJ, Stern, FB, Jones, JH. 1985. Mortality of Lead Smelter Workers. Am J Epidemiol; 122: 673-683.

U.S. Environmental Protection Agency (EPA). 1977. Air Quality Criteria for Lead. EPA-600/8-77-017, PB-280411. Office of Research and Development. Washington, D.C.

U.S. Environmental Protection Agency (EPA). 1980. Ambient Water Quality Criteria for Lead. EPA-440/5-80-057, PB-81-117681. Office of Water Regulations and Standards, Criteria and Standards Division. Washington, D.C.

U.S. Environmental Protection Agency (EPA). 1985. National Primary Drinking Water Regulations; Synthetic Organic Chemicals, Inorganic Chemicals and Microorganisms. Proposed Rule, Fed. Reg. 50 (November 13): 46960 (40 CFR Part 141).

U.S. Environmental Protection Agency (EPA). 1986. Superfund Public Health Evaluation Manual, EPA 640/1-86/060.

U.S. Environmental Protection Agency Integrated Risk Information System (IRIS). 1989. Lead.

Van Esch, GJ and Kroes, R. 1969. The Induction of Renal Tumors by Feeding Basic Lead Acetate to Mice and Hamsters. Br J Cancer; 23:765-771.

MERCURY REFERENCES

Agency for Toxic Substances and Disease Registry 1988. Toxicological Profile for Mercury. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service (Draft).

Armstrong, R.L., L. Leach, P. Belluscio et al. 1963. Behavioral change in the pigeon following inhalation of mercury vapor. Am Ind Hyg Assoc. J. 24:336-375.

Ashe, W., E.Largent and F. Dutra 1953. Behavior of the animal organism following inhalation of mercury. Arc. Ind. Hyg Occup. Med. 17:19-43.

Buchet, J. H. Roels, and A. Bernard. Assessment of renal function of workers exposed to inorganic lead, cadmium or mercury vapor. J. Occup. Med. 22:741-750.

Campbell, J. 1948. Acute mercurial poisoning by inhalation of metallic vapor in an infant. Can. Med. Assoc. J. 58:72-75.

Casserett and Doull's Toxicology: The Basic Science of Poisons. 1986. C.D. Klassen, M.O. Amdur and J. Doull, Eds., 3rd edition, MacMillan Publishing Company, New York, pp.605-609.

Fawer, R.F., Y. DeRibaupierre, M. Guillemin et al. 1983. Measurement of hand tremor induced by industrial exposure to metallic mercury. Br. J. Ind Med 40:204-208.

Ganser, A.L. and D.A.Kirschner. 1985. The interaction of mercurials with myelin: comparison of _in vitro_ and _in vivo_ effects. Neurotoxicology 6:63-78.

Hanninen, H. 1982. Behavior effect of occupational exposure to mercury and lead. Acta Neurol Scand 66:167-175.

IRIS 1989. Mercury.

Lilis, R., A. Miller and Y Lerman. 1985. Acute mercury poisoning with severe chronic pulmonary manifestations. Chest 88:306-309.

Steffek, A.J., R. Clayton, C. Siew et al.1987. Effects of elemental mercury vapor exposure on pregnant Sprague-Dawley rats. Teratology 35:59A.

Teng, C. and J. Brennan. 1959. Acute mercury vapor poisoning. A report of four cases with radiographic and pathologic correlation. Radiology 73:354-361.

SELENIUM REFERENCES

ASTDR. 1989. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Selenium. Atlanta, GA: ASTDR.

Barlow WM and Sullivan FM, Reproductive Hazards of Industrial Chemicals: Selenium. Academic Press, New York, NY, 1982 pp 483-500.

Carter RF. 1966. Acute selenium poisoning. Med J Aust 1:525-528.

Chowdhury AR, Venkatakrishna-Bhatt H. 1983. Effect of selenium dioxide on the testes of rat. Ind J Physiol Pharmacol 27:237-240.

Civil IES, McDonald MJA. 1978. Acute selenium poisoning: Case report. NZ Med J (May) 1978:354-356.

Gairola C, Chow CK. 1982 Dietary selenium, hepatic arylhydrocarbon hydroxylase and mutagenic activation of benzopyrene, 2-aminoanthracene and 2-aminofluorene. Toxicol Lett 11:281-287.

Harr JR, Bone JF, Tinsley IJ, et al. 1967. Selenium toxicity in rat. Histopathology. In: Muth OH, Oldfield JE, Weswig PH, ed. Selenium Biomed Proc 1st Int Symp, Oregon State Univ, 1966. Vol. II, Westport, Conn: AVI Publishing Co, 153-178.

Hopper SA, Greig A, McMurray CH. 1985. Selenium poisoning in lambs. Vet Record 116:569-571.

Koppel C, Baudisch H, Beyer K-H, et al. 1986. Fatal poisoning with selenium dioxide. J clini Toxicol 24:21-35.

NAS 1976a. Selenium. Comm Med Biol Effects Environ Pollut Subcomm - Selenium. Washington, DC: National Academy of Sciences.

NTP. 1980c. Bioassay of selenium sulfide (gavage) for possible carcinogenicity. Bethesda, MD: National Toxicology Program, National Cancer Institutes of Health. NCI Technical Report Series No. 194, NTP No. 80-17.

Oster O, Prellwitz W. 1982. A methodological comparison of hydride and carbon furnace atomic absorption spectroscopy for the determination of selenium in serum. Clin Chim Acta 124:277-291.

Ostadalova, I. and Babicky, A. 1980 Toxic effects of various selenium compounds on the rat in the early postnatal period. Arch tosical 45:207-211.

Palmer IS, Arnold RC, Carlson CW. 1973 Toxicity of various selenium derivatives to chick embryos. Poult sci 52:1841-1846.

Palmer IS, Olson OE. 1974. Relative toxicities of selenite and selenate in the drinking water of rats. J Nutr 104:306-314.

Salonen JT, Alfthan G, Huttenen JK, et al. 1982. Association between cardiovascular death myocardial infarction and serum selenium in matched pair longitudinal study. *Lancet* 2:175-179.

Schroeder HA, Mitchener M. 1971a. Selenium and tellurium in rats: Effects on growth, survival, and tumors. J Nutr 101:1531-1540.

Schroeder HA, Mitchener M. 1971b. Toxic effects of trace elements on reproduction of mice and rats. Arch Environ Health 23:102-106.

Schroeder HA, Mitchener M. 1972. Selenium and tellurium in mice: Effects on growth, survival and tumors. Arch Environ Health 24:66-71.

Shamberger RJ, Tytko SA, Willis CE. 1976. Antioxidants and cancer part VI. Selenium and age-adjusted human cancer mortality. Arch Environ Health 31:231-235.

Shamberger RJ. 1986 Selenium metabolism and function. Clin Physiol Biochem 4:42-49.

Tarantal AR, Willhite CC, Laslsey BL, Murphy CJ, Miller CJ, Cukierski MF, Book SA, and Hendrickx AG. In Press. Developmental Toxicity of L-selnomethionine in Macaca fascicularis. Fund. Appl. Toxicol.

Valentine JL, Faraji B, Kang HK. 1988. Human glutathione peroxidase activity in cases of high selenium exposures. Environ Res 45:16-27.

Volgarev MN, Tscherkes LA. 1967. Further studies in tissue changes associated with sodium selenate. In: Muth OH, ed. Selenium in Biomedicine, Proceedings of the 1st International Symposium, Oregon State University. Westport, CT: AVI Publishing Co, 1979-184.

Wahlstrom RC, Olson OE. 1959a. The relation of pre-natal and pre-weanling treatment to the effect of arsanilic acid on selenium poisoning in weanling pigs. J Anim Sci 18:579-582.

Yang G, Ge K, Chen J, et al. 1988. Selenium-related endemic diseases and the daily selenium requirement of humans. In: Borne GH, ed. World review of nutrition and dietetics. Sociological and medical aspects. Vol. 55, Basel: Karger, 98-152.

ZINC REFERENCES

Clayton, GD and Clayton, FE. 1981. Patty's Industrial Hygiene and Toxicology. 3rd ed. Vol. II New York, NY: Wiley and Sons.

Kaassen, CD, Amdur, MO, Doull, JD. 1986. Casarett and Doull's Toxicology: The Basic Science of Pousons, 3rd ed. Macmillan Publishing Co., New York.

National Institute for Occupational Safety and Health (NIOSH). 1986. Registry of Toxic Effects of Chemical Substances. Data Base. Washington, D.C.

BENZENE REFERENCES

Aksoy M., Dincol K, Erdem S, Akgun T, Dincol G. 1972. Details of blood changes in 32 patients with pancytopenia associated with long term exposure to benzene. Brit J Industr Med 29:56:64.

Aksoy M, Erdem S, Dincol G. 1974. Leukemia in shoe workers exposed chronically to benzene. Blood 44:837.

Choy, W.N., J.T.MacGregor, M.D. Shelby and R.R. Maronport. 1985. Induction of micronuclei in the perpherial blood of mice exposed chronically to benzene. Mutat. Res. 143:55-59.

Danford, N.C. 1985. Tests for chromosome aberrations and aneuploidy in the Chinese hamster fibroblast cell line CH1-L. In: Evaluation of Short-term Tests for Carcinogenicity: Report on the International Program on Chemical Safety Collaborative Study on In Vitro Assays. J. Ashby, F.J. deSerres, M. Draper et al. Eds.,Elsevier, Amsterdam, pp. 156-169.

Drew RT, Fouts JR. 1974. The lack of effects of pretreatment with phenobarbital and chlorpromazine on the acute toxicity of benzene in rats. Toxicol Appl Pharmacol 27:183-193.

Erexsen, G.L., J.L. Wilner, A.D. Klingerman. 1985. Sister chromatid exchange induction of human lymphocytes exposed to benzene and its metabolites in vitro. Cancer Res. 45: 2471-2477.

Garner, R.C. 1985. Summary report on the performance of gene mutation assays in mammalian cells in culture. In: Evaluation of Short-term Tests for Carcinogenicity: Report on the International Program on Chemical Safety Collaborative Study on In Vitro Assays. J. Ashby, F.J. deSerres, M. Draper et al. Eds.,Elsevier, Amsterdam, pp. 85-94.

Gill DP, Ahmed AE. 1981. Covalent binding of [14C] benzene to cellular organelles and bone marrow nucleic acids. Biochem Pharmacol 30:1127-1131.

Goldstein, B.D. 1989. Symposium on benzene Metabolism, Toxicity and Carcinogenesis. Environ. Health Perspect. 82:3-310.

Howard, C.A., T. Sheldon, C.R. Richardson. 1985. Chromosomal analysis of human lymphocytes exposed in vitro to five chemicals. In:Evaluation of Short-term Tests for Carcinogenicity: Report on the International Program on Chemical Safety Collaborative Study on In Vitro Assays. J. Ashby, F.J. deSerres, M. Draper et al. Eds.,Elsevier, Amsterdam, pp. 124-137.

IARC. 1982. International Agency for Research on Cancer. Monographs on the evaluation of the carcinogenic risk of chemicals to humans. Some industrial chemicals and dyestuffs. IARC Monogr Eval Carcinog Risk Chem Man 29:93-148, Supplement 4, pp. 56-57.

Infante, P.F., R.A. Rinsky, J.K. Wagner and R.J. Young. 1977. Benzene and leukemia. the Lancet 2(8043):867-869.

Kalf, G.F., G.B.Post, R. Snyder. 1987. Solvent toxicity: Recent advances in the toxicity of benzene, the glycol ethers and carbon tetrachloride. Ann. Rev. Pharmacol. Toxicol. 27:399-427.

Keller KA, Snyder CA. 1986. Mice exposed in utero to low concentrations of benzene exhibit enduring changes in their colony forming hematopoietic cells. Toxicology 42:171-181.

Kissling M, Speck B. 1972. Further studies on experimental benzene induced aplastic anemia. Blut 25:97-103.

Li GL, Yin N, Watanabe T. et al. 1986. Benzene-specific increase in leukocyte alkaline phosphatase activity in rats exposed to vapors of various organic solvents. J Toxicol Environ Health 19:581-589.

Maltoni C. 1983a. Myths and facts in the history of benzene carcinogenicity. Adv Mod Environ Toxicol 4:1-15.

Maltoni, C., B.Conti, and G. Cotti. 1983. Benzene: A multipotential carcinogen. Results of long-term bioassays performed at the Bologna Institute of Oncology. Am. J. Ind. Med. 4:589-630.

Maltoni C, Conti B, Cotti G. 1983b. Benzene: a multi potential carcinogen. Results of long term bioassays performed at the Bologna Institute of Oncology. Am J Ind Med 4:589-630.

Medinsky, M.A., P.J. Sabourin, G. Lucier et al. 1989. A physiological model for stimulation of benzene metabolism by rats and mice. Toxicol. Appl. Pharmacol. 99:193-206.

Meyne J, Legator MS. 1980. Sex related differences in cytogenetic effects of benzene in the bone marrow of Swiss mice. Environ Mutagen 2:43-50.

NTP 1986. Toxicology and carcinogenesis studies of benzene (CAS No. 71-43-2) in F344/N rats and B6C3F1 mice (gavage studies). NTP Technical report Series No. 289. NIH Publication No. 86-2545.

O'Bryan TO, Ross R. 1986. Chemical scoring system for hazard and exposure assessment. IR&A, Oak Ridge National Laboratory.

Ott MG, Townsend JC, Fishbeck WA, Langner RA. 1978. Mortality among workers occupationally exposed to benzene. Arch Environ Health 33:3-10.

Rinsky, R.A., B. Alexander, R. Hornung, T.G. Filloon, R.J. Young, A.H Okun and P.J. Landrigan. 1987. Benzene and Leukemia: An Epidemiologic Risk Assessment. New Eng. J. Med. 316:1044-1050.

Rinsky RA, young RJ, Smith AB. 1981. Leukemia in benzene workers. Am J Ind Med 2:217-245.

Sandmeyer EE. 1981. Aromatic hydrocarbons. In: Patty's industrial hygiene and toxicology, Vol. 2, 3rd rev. ed., Clayton GD, Clayton, FE, eds. New York: Interscience Publishers: pp. 3253-3283.

Sarto, F., I. Cominato, A.M. Pinton et al. 1984. A Cytogenetic study on workers exposed to low concentrations of benzene. Carcinogenesis 5:827-834.

Shimizu, M., Y. Yasui, and N. Matsumoto. 1983. Structural specificity of aromatic compounds with special reference to mutagenic activity in Salmonella typhimurium: A series of chloro- or fluoro-nitrobenzenes. Mutat. Res. 116:217-238.

Snyder CA. 1987. Benzene. In: Ethyl Browning's toxicity and metabolism of industrial solvents, 2nd ed., Vol. 1: Hydrocarbons. Snyder R, ed.

Thienes H, Haley TJ. 1972. Title not given. In: Clinical toxicology. Philadelphia, PA: Lea & Fegiger. (As reported in Sandmeyer 1981).

Toft K, Olofsson T, Tunek A, Berlin M. 1982. Toxic effects on mouse bone marrow caused by inhalation of benzene. Arch Toxicol 51:295-302.

Von Oettingen WF. 1940. Title not given. Public Health Bulletin No. 255. Washington,DC: U.S. Public Health Service. (As reported in Sandmeyer 1981)

Yin, et al 1987 Occupational exposure to benzene in China BR. J Ind Med 44:192-195.

CARBON TETRACHLORIDE REFERENCES

Adams EM, Spencer HC, Rowe VK, et al. 1952. Vapor toxicity of carbontetrachloride determined by experiments on laboratory animals. Arch Ind Hyg Occup Med 6:50-66.

Agency for Toxic Substances and Disease Register, U.S. Public Health Service (ATSDR). 1990. Toxicological Profile for Carbon Tetrachloride.

Alumot E, Nachtomi E, Mandel E, et al. 1976. Tolerance and acceptable daily intake of chlorinated fumigants in the rat diet. Food Cosmet Toxicol 14:105-110.

Ashe WF, Sailer S. 1942. Fatal uremia following single exposure to carbon tetrachloride fumes. Ohio State Med J 38:553-555.

Barnes R, Jones RC. 1967. Carbon tetrachloride poisoning. Am Ind Hyg Assoc J28:557-560.

Bogers M, Appelman LM, Feron VJ, et al. 1987. Effects of the exposure profile on the inhalation toxicity of carbon tetrachloride in male rats. J Appl Toxicol 7:185-191.

Boyd MR, Statham CN, Longo NS. 1980. The pulmonary Clara cell as a target for toxic chemicals requiring metabolic activation; studies with carbon tetrachloride. J Pharmacol Exp Ther 212:109-114.

Bruckner JV, MaKenzie WF, Muralidhara S, et al. 1986. Oral toxicity of carbontetrachloride: acute, subacute and subchornic studies in rats. Fund Appl Toxicol 6:16-34.

Cohen MM. 1957. Central nervous system in carbon tetrachloride intoxication. Neurology 7:238-244.

Craddock VM, Henderson AR. 1978 De novo and repair replication of DNA in liver of carcinogen-treated animals. Cancer Res 38:2135-2143.

Della Porta GD, Terracini B, Shubik P. 1961. Induction with carbon tetrachloride of liver cell carcinomas in hamsters. J Natl Cancer Inst 26:855-863.

Edwards J, Heston WE, Dalton AJ. 1942. Induction of the carbon tetrachloride hepatomain strain L mice. J Natl Cancer Inst 3:297-301.

Elkins HB. 1942. Maximal allowable concentrations. II. Carbon tetrachloride. J Ind Hyg Toxicol 24:233-235.

Eschenbrenner AB, Miller E. 1946. Liver necrosis and the induction of carbontetrachloride hepatomas in strain A mice. J Natl Cancer Inst 6:325-341.

Gardner GH, Gove RC, Gustafson RK, et al. 1925. Studies on the pathological histology of experimental carbon tetrachloride poisoning. Bull Johns Hopkins Hosp 36:107-133.

Gosselin RE, Hodge HC, Smith RP, Gleason MN, eds. 1976. Clinical toxicology of commercial products. Acute poisoning. 4th ed., Baltimore, MD: The Williams and Wilkins Co. 13, 92-97, 110.

Gould VE, Smuckler EA. 1971. Alveolar injury in acute carbon tetrachloride intoxication. Arch Intern Med 128:109-117.

Gary I. 1947. Carbon tetrachloride poisoning -- Report of seven cases with two deaths. NY State J Med 47:2311-2315.

Guild WR, Young JV, Merrill JP. 1958. Anuria due to carbon tetrachloride intoxication. Ann Intern Med 48:1221-1227.

Hall MC. 1921. The use of carbon tetrachloride for the removal of hookworms. J Am Med Assoc 77:1641-1643.

Hardin BL. 1954. Carbon tetrachloride poisoning. A review. Ind Med Surg 23:93-105.

Hayes JR, Condie LW, Berzelleca JF. 1986. Acute, 14-day repeated dosing, and 90-day subchronic toxicity studies of carbon tetrachloride in CD-1 mice. Fund Appl Toxicol 7:454¬463.

Heimann H, Ford CA. 1941. Low concentration of carbon tetrachloride capable of causing mild narcosis. Ind Bull 20, July-August.

Hollinger MA. 1982. Biochemical evidence for pulmonary endothelial cell injury after carbon tetrachloride administration in mide. J Pharmacol Exp Therap 222:641-4.

Jennings RB. 1955. Fata fulminant acute carbon tetrachloride poisoning. Arch Pathol 59:269-284.

Johnstone RT. 1948. Occupational medicine and industrial hygiene. St. Louis, MO: CV Mosby Co., pp 148-158.

Kazantzis G, Bomford RR. 1960. Dyspepsia due to inhalation of carbon tetrachloride vapor. Lancet, February 13, 360-362.

Kittleson KD, Borden CW. 1956. Acute renal failure due to carbon tetrachloride poisoning. Northwestern Univ Med School Mag 30:117-123.

Korsrud GO, Grice HC, McLaughlan JM. 1972. Sensitivity of several serum enzymes in detecting carbon tetrachloride-induced liver damage in rats. Toxicol Appl Pharmacol 22:474-483.

Kronevi T, Wahlberg J, Holmberg B. 1979. HIstopathology of skin, liver, and kidney after epicutaneous administration of five industrial solvents to guinea pigs. Environ Res 19:56-69.

Lamson PD, Minot AS, Robbins BH. 1928. The prevention and treatment of carbontetrachloride intcxication. J Am Med Assoc 90:345-346.

Leach CN. 1922 Carbon tetrachloride in the treatment of hookworm disease. J Am Med Assoc 78:1789-1790.

MacMahon HE, Weiss S. 1929. Carbon tetrachloride poisoning with microscopic fat in the pulmonary artery. Am J Pathol 5:623-630.

McGuire LW. 1932. Carbon tetrachloride poisoning. J Am Med Assoc 99:988-989.

McLean AEM, McLean EK. 1966. The effect of diet and 1,1,1-trichloro-2,2-bis-(p-chlorophenyl)ethane (DDT) on microsomal hydroxylating enzymes and on sensitivity of rats to carbon tetrachloride poisoning. Biochem J 100:564-571.

Mirsalis, JC, Butterworth BE. 1980. Detection of unscheduled DNA synthesis in hepatocytes isolated from rats treated with genotoxic agents: an in vivo-in vitro assay for potential carcinogens and mutagens. Carcinogenesis 1:621-625.

NCI. 1976. Report on carcinogenesis bioassay of chloroform. Bethesda, MD: National Cancer Institute, March 1, 1976.

NCI (National Cancer Institute). 1976b. Carcinogenesis Bioassay of Trichloroethylene. National Cancer Institute Carcinogenesis Technical Report Series, No. 2. NCI-CG-TR-2. February.

NCI (National Cancer Institute). 1977. Bioassay of 1,1,1-Trichlorethane for Possible Carcinogenicity. National Cancer Institute Carcinogenesis Technical Report Series, No. 3. NCI-CG-TR-3. January.

New PS, Lubash GD, Scherr L, et al. 1962. Acute renal failure associated with carbontetrachloride intoxication. J Am Med Assoc 181:903-906.

Norwood WD, Fuqua PA, Scudder BC. 1950. Carbon tetrachloride poisoning. Arch Ind Hyg Occup Med 1:90-100.

Paustenbach DJ, Carlson GP, Christian JE, et al. 1986a. A comparative study of the pharmacokinetics of carbon tetrachloride in the rat following repeated inhalation exposures of eight and 11.5 hr/day. Fund Appl. Toxicol 6:484-497.

Paustenbach DJ, Christian JE, Carlson GP, et al. 1986b. The effect of an 11.5-hr/day exposure schedule on the distribution and toxicity of inhaled carbon tetrachloride in the rat. Fund Appl Toxicol 6:472-483.

Perez AJ, Courel M, Sobrado J, et al. 1987. Acute renal failure after topical application of carbon tetrachloride. Letter to editor. Lancet: February 28, 515-516.

Phelps BM, Hu CH. 1924. Carbon tetrachloride poisoning. Report of two fatal cases and a series of animal experiments. J Am Med Assoc 82:1254-1256.

Pound AW, Horn L, Lawson TA. 1973. Decreased toxicity of dimethylnitrosamine in rats after treatment with carbon tetrachloride. Pathology 5:233-242.

Prendergast JA, Jones RA, Jenkins LJ, et al. Effects on experimental animals of long-term inhalation of trichloroethylene, carbon tetrachloride, 1,1,1-trichloroethane, dichloroflouromethane, and 1,1-dichloroethylene. Toxicol Appl Pharmacol 10:270-289.

Roudabush RL, Terhaar CJ, Fassett DW, et al. 1965. Comparative acute effects of some chemicals on the skin of rabbits and guinea pigs. Toxicol Appl Pharmacol 7:559-565.

Schwetz BA, Leong BKJ, Behring PJ. 1974. Embryo- and fetotoxicity of inhaled carbontetrachloride, 1,1-dichloroethane and methyl ethyl ketone in rats. Toxicol Appl Pharmacol 28:452-64.

Sittig, M. 1985. Handbook of Hazardous Chemicals and Carcinogens, 2nd ed. Noyes Publications, Park Ridge, New Jersey.

Smetana J. 1939. Nephrosis due to carbon tetrachloride. Arch Intern Med 63:760-777.

Smyth HF. 1935. Carbon tetrachloride in industry-the present status and plans for further necessary studies. Ind Med 4:12-15.

Smyth HF, Smyth HF Jr., Carpenter CP. 1936. The chronic toxicity of carbontetrachloride; animal exposure and field studies. J Ind Hyg Toxicol 18:277-298.

Stevens H, Forster FM. 1953. Effect of carbon tetrachloride on the nervous system. Arch Neurol Psychiat 70:635-649.

Stewart A, Witts LJ. 1944. Chronic carbon tetrachloride intoxication. Br J Ind Med 1:11-19.

Stewart, RD, Gay HH, Erley DS, et al. 1961. Human exposure to carbon tetrachloride vapor. J Occup Expos 3:586-590.

Stewart RD, Boettner EA, Southworth RR, et al. 1963. Acute carbon tetrachloride intoxication. J Am Med Assoc 183:94-97.

Straus B. 1954. Aplastic anemia following exposure to carbon tetrachloride. J Am Med Assoc 155:737-739.

Striker GE, Smuckler EA, Kohnen PW, et al. 1968. Structural and functional changes in rat kidney during CC14 intoxication. Am J Pathol 53:769-789.

Svirbely JL, Highman B, Slford WC, et al. 1947. The toxicity and narcotic action of monochloromonbromomethane with special reference to inorganic and volatile bromide in blood, urine and brain. J Ind Hyg 29:382-389.

Tracey, JP, Sherlock P. 1968. Hepatoma following carbon tetrachloride poisoning. NewYork J Med 68:2202-2204.

Environmental Protection Agency. Integrated Risk Information System (IRIS). 1990. Carbon Tetrachloride.

Umiker W, Pearce J. 1953. Nature and genesis of pulmonary alternations in carbontetrachloride poisoning. Arch Pathol 55:203-217.

von Oettingen WF. 1964. The halogenated hydrocarbons of industrial and toxicological importance. In: Browning E, ed. Elsevier Monographs on Toxic Agents. New York,NY: Elsevier Publishing Co.

Wahlberg JE, Boman A. 1979. Comparative percutaneous toxicity of ten industrial solvents in the guinea pig. Scand J Work Environ Health 5:345-351.

Wilson JG. 1954. Influence of the offspring of altered physiologic states during pregnancy in the rat. Ann NY Acad Sci. 57:517-525.

CHLOROFORM REFERENCES

Bomski, H, Sobolweska, A, Strakowski, A. 1967. Toxic damage of the liver by chloroform in chemical industry workers. Arch Gewerbepathol Gewerbehy 24:127-134 (FRG) (translated from German).

Jorgenson, TA, Meierhenry, EF, Rushbrook, CJ, et al. 1985. Carcinogenicity of chloroform in drinking water to male Osborne-Mendel rats and female B6G3F1 mice. Fund Appl Toxicol (USA)5(4):760-769.

Lundberg, I, Ekdahl, M, Kronevi, T, Lidmus, V, Lundberg, S. 1986. Relative hepatotoxicity of some industrial solvents after intraperitoneal injection or inhalation exposure to rats. Environ Res 40(2):411-420.

NCI (National Cancer Institute). 1976. Report on Carcinogenesis Bioassay of Chloroform. NTIS PB-264018.

Roe, FJC, Palmer, AAK, Worden, AN, Van Abbe, NJ. 1979. Safety evaluation of toothpaste containing chloroform. I. Long-term studies in mice. J Environ Toxicol 2:799-819.

Schroeder, HG. 1965. Acute and delayed chloroform poisoning. A case report. Br J Anaesth 37:972-975.

Torkelson, TR, Oyen, F, Rowe, VK. 1976. The toxicity of chloroform as determined by single and repeated exposure of laboratory animals. Am Ind Hyg Assoc J 37:697-704.

CHLOROBENZENE REFERENCES

Barkely J, Bunch J, Bursey JT, et al., 1980. Gas chromatography mass spectrometry computer analysis of volatile halogenated hydrocarbons in man and his environment a multi media environmental study. Biomed Mass Spectrum 7:139:147.

A. Brodzinsky R, Singh HB. 1983. Volatile organic chemicals in the atmosphere: An assessment of pp available data. Research Triangle Park, NC: U.S. Environmental Protection Agency, Office of Research and Development. EPA 600/3:83:0270a.

Dilley JV. 1977. Toxic evaluation of inhaled chlorobenzene (monochlorobenzene). Cincinnati, OH: National Institute of Occupational Safety and Health, Division of Biomedical and Behavioral Sciences. NTIS No. PB:276623.

EPA. 1985. Health assessment document for chlorinated benzenes: Final Report. Cincinnati, OH: U.S. Environmental Protection Agency, Office of Research and Development. EPA/600/8:84/0154F.

Hazleton Laboratories. 1967. Three month subacute oral study rats: Monochlorobenzene. Final Report. Submitted to Monsanto Company. Project No. 241:104. March 9.

Irish DD. 1963. Halogenated hydrocarbons. II. Cyclic. In: Patty FA, ed. Industrial hygiene and toxicology. Vol 2. 2nd ed., New York, NY: John Wiley and Sons, 1333.

John JA, Hayes WC, Hanley TR Jr, et al. 1984. Inhalation teratology study on monochlorobenzene in rats and rabbits. Toxicol Appl Pharmacol 76:365:373.

Nair RS, Barter JA, Schroeder RE, et al. 1987. A two generation reproduction study with DD monochlorobenzene vapor in rats. Fundam Appl Toxicol 9:678:686.

NTP. 1985. Toxicology and carcinogenesis studies of chlorobenzene (CAS No. 108-90-70) hh in F344/N rats and B6C3F mice (gavage studies). Technical report series No. 261. Research Triangle Park, NC: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Toxicology Program. NIH Publication No. 86:2517.

Reich H. 1934. [Puran (monochlorobenzene) poisoning in a 2 year old child.] Sammlvon Vergiftungsfallen 5:193-194. (German)

Rimington C, Ziegler G. 1963. Experimental porphyria in rats induced by chlorinated benzenes. Biochem Pharmacol 12:1387-1397.

Rozenbaum ND, Blekh RS, Kremneva SN, et al. 1947. [Use of chlorobenzene as a solvent from the standpoint of industrial hygiene.] Gig Sanit 12:21-24. (Russian)

Sittig M. 1985. Handbook of toxic and hazardous chemicals and carcinogens. 2nd ed. (Park Ridge, NJ: Noyes Publications, 225-227.

Tabak HH. Quave SA, Mashni CI, et al. 1981. Biodegradability studies with organic LL priority pollutant compounds. J Water Pollut Control Fed 53:1503-1518.

Zub M. 1978. Reactivity of the white blood cell system to toxic action of benzene and its pp derivatives. Acta Biol Cracov 21:163-174.

1,2- and 1,3-DICHLOROBENZENE REFERENCES

ACGIH (American Conference of Governmental Industrial Hygienists). PP 1986 Documentation of the Threshold Limit Values and Biological Exposure Indices. 5th Ed. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, Inc. pp. 428; 435-436.

Anderson, D. 1976. Paradichlorobenzene: Estimation of its mutagenic potential in the Salmonella typhimurium plate incorporation mutagenicity assay. Unpublished report: Imperial Chemical Industries Ltd, Central Toxicology Laboratory, Alderley Park, Macclesfield, Cheshire, V.K. (cited in Loeser and Litchflied, 1983).

Anderson, D. and Hodge, M.C.E. 1976. Paradichlorobenzene: Dominant lethal study in the mouse. Unpublished report: Imperial chemical Industries Ltd., Central Toxicology Laboratory, Alderly Park, Macclesfield, Cheshire, U.K. (cited in Loeser and Litchfield, 1983).

Anderson, D. and Richardson, C.R. 1976. Paradichlorobenzene: Cytogenetic study in the rat. Unpublished report: Imperial chemical Industries Ltd., Central Toxicology Laboratory, Alderly Park, Macclesfield, Cheshire, UK (cited in Loeser and Litchfield, 1983).

Andersen, K.J., Leighty, E.G. and Takahashi, M.T. 1972. Evaluation of herbicides for possible mutagenic properties. J. Agric. Food Chem. 20(3): 649-656.

Azouz, W.M., Parke, D.V. and Williams, R.T. 1955. Studies in detoxication. The metabolism of halogenobenzenes. Ortho and para-dichlorobenzenes. Biochem. J. 59(3): 410-415.

Brodzinsky, R. and Singh, H.B. 1982. Volatile organic chemicals in the atmosphere: an assessment of available data. Contract No. 68-02-3452. Environ. Sci. Res. Lab., ORD, U.S. EPA, Research Triangle Park, NC. (Cited in EPA, 1985.)

Carey, G.P. and McDonough, E.S. 1943. On the production of polyploidy in Allium with paradichlorobenzene. Jour. of Hereditary. 34:238.

Cotter, L.H. 1953. Case Reports: Paradichlorobenzene poisoning from insecticides. N.Y. State J. Med. 53: 1690-1692.

Downing, J.G. 1939. Dermatitis from orthodichlorobenzene. JAMA 112:1457.

Elkins, H.B. 1959. The Chemistry of Industrial Toxicology. New York: John Wiley and Sons, Inc.

Frank, S.B. and Cohen, H.J. 1961. Fixed drug eruption due to paradichloro-benzene. New York J. Med. 61:4079.

Gadrat, J., Monnier, J., Ribet, A and Bourse, R. 1962. Acute hemolytic anemia in a female worker of a dyeing and dry-cleaning shop exposed to inhalation of chlorobenzenes. Arch. Maladies Prof. Med. Travail Secrite Sociale. 23 (10/11):710-174 (Fre). (Cited in EPA, 1985.)

Giavini, E., Broccia, M.L., Prati, M. and Vismara, C. 1986. Teratologic evaluation of p-dichlorobenzene in the rat. Bull. Environ. Contam. Toxicol. 37:164-168.

Girard, R., Tolot, F., Martin, P. and Bourret, J. 1969. Serious blood disorders and exposure to chlorine derivatives of benzene (A report of seven cases). J. Med. Lyon. 50(1164):771-773 (Fre.) (Cited in U.S. EPA, 1985.)

Guerin, M. and Cuzin, J. 1961. Skin tests on mice for determining the carcinogenic activity of cigarette smoke tar. Bull. de l'Assoc. Francais pour I'Etude du Cancer. 48:112 (Fre). (Cited in U.S. EPA, 1980.)

Hallowell, M. 1959. Acute hemolytic anemia following the ingestion of paradichlorobenzene. Arch. Dis. Child. 34: 74-75.

Hawkins, D.R., Chassequd, L.F., Woodhouse, R.N. and Cresswell, D.G. 1980. The distribution, excretion and biotransformation of p-dichloro (14C) benzene in rats after repeated inhalation, oral and subcutaneous doses. Xenobiotica. 10(2):81-95.

Haworth, S. Lawlor, T., Mortelmans, K., Speck W. and Zeiger, E. 1983. Salmonellamutagenicity test results for 250 chemicals. Environ. Mutagen. (Suppl.1.):34-142.

Hayes, W.C., Hanley, T.R. Jr., Gushow, T.S. Johnson, K.A. and John, J.A. 1985. Teratogenic potential of inhaled dichlorobenzenes in rats and rabbits. Fundam. Appl. Toxicol.5(1) 190-202.

Hollingsworth, R.L., Rowe, V.K., Oyen, F., Hoyle, H.R. and Spencer, H.C. 1956. Toxicity of paradichlorobenzene. Determinations on experimental animals and human subjects. Arch. Ind. Hlth. 14:138-147.

Hollingsworth, R.L., Rowe, V.K. Oyen, F., Torkelson, T.R. and Adams, I.M. 1958. Toxicity of o-dichlorobenzene. Studies on animals and industrial experience. Arch. Ind. Health. 17(19):180:187.

Hodge, M.C.E., Palmer, S., Wilson, J. and Bennett, I.P. 1977. Paradichlorobenzeneteratogenicity study in rats. Unpublished report: Imperial Chemical Industries Ltd., Central Toxicology Laboratory, Alderly Park, Macclesfield, Cheshire, UK. (cited in Loeser and Litchfield, 1983; Hayes et al., 1985).

IARC (International Agency for Research on Cancer). 1974. IARC monographs on the evaluation of the carcinogenic risk of chemicals to man. Vol 7: Some antithyroid and related substances, nitrofurans and industrial chemicals: Ortho and para-dichlorobenzenes. pp 231-244.

IARC (International Agency for Research on Cancer). 1982. IARC monographs on the evaluation of the carcinogenic risk of chemicals to man. Vol. 29: Ortho-and paradichlorobenzenes pp 213¬218.

IARC (International Agency for Research on Cancer). 1987. IARC monographs on the evaluation of carcinogenic risks to humans. Overall evaluations of carcinogencity: an updating of IARC monographs Volumes 1 to 42. Suppl 7. pp. 192-193.

Johnston, P., Hodge, V. and Slimak, K. 1979. Materials Balance-Task 4-Chlorobenzenes. (EPA-560/13-80-001). Washington, D.C. U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances, pp. 2-19 - 3-10.

Kimura, R., Hayashi, T., Sato, M., Aimoto, T. and Murata, T. 1979. Identification of sulfur-containing metabolites of p-dichlorobenzene and their distribution in rats. J. Pharm. Dyn. 2(4):237-244.

Kimura, R., Kawai, M., Kato, Y., Sato, M., Aimoto, T. and Murata, T. Role of 3,5-dichloromethylsulfone, a metabolite of m-dichlorobenzene, in the induction of hepaticmicrosomal drug-metabolizing enzymes by m-dichlorobenzenes in rats. Toxicol. Appl. Pharmacol. 78(2):300-309.

Lawlor, T., Haworth, S.R. and Boytek, P. 1979. Evaluation of the genetic activity of nine chlorinated phenols, seven chlorinated benzenes, and three chlorinated hexanes (Abstract no. Ca¬10). Environ. Mutagenesis. 1:143.

NTP (National Toxicology Programme) 1985. Toxicology and Carcinogenesis Studies of 1,2-Dichlorobenzene (o-Dichlorobenzene). (CAS No. 95-50-1) in F344/N Rats and B6C3F1 Mice (Gavage Studies) (NTP TR 255; NIH. Publ. No. 86-2511), Research Triangle Park, NC.

NTP (National Toxicology Program). 1987. Toxicology and Carcinogenesis Studies of 1,4-Dichlorobenzene (CAS No. 106-46-7) in F344/N Rats and B6C3F1 mice (Gavage Studies) (NTP TR No. 319; NIH Publ. No. 87-2575), Research Triangle Park. (Cited in IARC 1987).

Parsons, D.L. 1942. On early tumour formation in pure-line mice treated with carcinogenic compounds and the associated blood and tissue changes. J. Path. Bact. 54:321-330.

Perrin, M. 1941. Possible harmfulness of paradichlorobenzene used as a moth killer. Bull. de l'Acad. de Med. 125:302.

Perocco, P. Bolognesi, S. and Alberghini, W. 1983. Toxic activity of seventeen industrial solvents and halogenated compounds on human lymphocytes cultured in vitro. Toxicol. Lett. 16:69-75.

Petit, G. and Champeix, J. 1948. Does an intoxication caused by paradichlorobenzene exist? Arch. Malad. Profess. Med. 9:311-312. (Cited in EPA, 1985.)

Poland, A. Goldstein, J., Hickman, P. and Burse, V.W. 1971. A reciprocal relationship between the induction of aminolevulinic acid synthetase and drug metabolism produced by m-dichlorobenzene. Biochem. Pharmacol. 20(6):1281-1290.

Prasad, I. 1970. Mutagenic effects of the herbicide 3', 4'-dichloroproprionanilide and its degradation products. Can. J. Microbiol. 16:369-372.

Reid, W.D. and Krishna, G. 1973. Centrilobular hepatic necrosis related to covalent binding of metabolites of halogenated aromatic hydrocarbons. Ex. Mo. Pathol. 18:80-99.

Riedel, H. 1941. Einge beobachtungen uber orthodichlorobenzol. Arch. Gewerbepath. Bewerbehyg. 10:546-549. (Cited in EPA, 1985).

Riley, R.A., Chart, I.S. Doss, A., Gore, C.W., Patton, D. and Weight, T.M. 1980a. Para-dichlorobenzene: Long term inhalation study in the rat. Unpublished report: Imperial Chemical Industries Ltd., Central Toxicology laboratory, Alderly Park, Macclesfield, Cheshire, U.K. (Cited in Loeser and Litchfield, 1983.)

Riley, R.A. Chart, I.S., Gaskell, B. and Gore, C.W. 1980b. Para-dichlorobenzene: Long term inhalation study in the mouse. Unpublished report: Imperial Chemical Industries Ltd., Central Toxicology Laboratory, Alderly Park, Macclesifled, Cheshire,U.K. (Cited in Loeser and Litchfield, 1983).

Rimington, C. and Ziegler, G. 1963. Experimental porphyria in rats induced by chlorinated benzene. Biochem. Pharmacol. 12:1387-1397.

Shackelford, W.M. and Keith, L.H. 1976. Frequency of Organic Compounds Identified in Water. (EPA-600)/4-76-062), Athens GA, Environmental Research Laboratory, U.S.Environmental Protection Agency, pp. 37, 72, 76-77.

Sharma, A.K. and Bhattacharyya. 1956. Chromosome breakage through para-dichlorobenzene treatment. Cytologia 21:353-360.

Sharma, A.K. and Sarkar, S.K. 1957. A study on the comparative effect of chemicals on chromosomes of roots, pollen mother cells and pollen grains. Proc. Indian Acad. Sci. Sect. B. 45(6):288-293.

Srivastava, L.M. 1966. Induction of mitotic abnormalities in certain genera of tribe Vicieae by paradichlorobenzene. Cytologia, 31:166-171.

Sumers, J., Fuhrman, M. and Kelman, A. 1952. Hepatitis with concomitant esophageal varices following exposure to moth ball vapors. N.Y. State J. Med 52:1048-1049.

U.S. EPA (U.S. Environmental Protection Agency) 1980. Ambient Water Quality Criteria for Dichlorobenzenes. Washington, D.C.: Office of Water Regulations and Standards, Criteria and Standards Division.

U.S. EPA (U.S. Environmental Protection Agency) 1985. Health Assessment Document for Chlorinated Benzenes. Cincinnati, OH: Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, Office of Research and Development.

Varshavskaya, S.P. 1967a. The hygienic standardization of mono- and dichlorobenzenes in reservoir waters. Nauch. Tr. Aspir. I. Ordin. Pervyi Mosk. Med. Institut. 175. (in Russian) (Cited in U.S. EPA, 1980).

Varshavskaya, S.P. 1967b. Comparative toxicological characteristics of chlorobenzene and dichlorobenzene (ortho- and para-isomers) in relation to the sanitary.

1,4-DICHLOROBENZENE REFERENCES

ACGIH (American Conference of Governmental Industrial Hygienists). PP 1986 Documentation of the Threshold Limit Values and Biological Exposure Indices. 5th Ed. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, Inc. pp. 428; 435-436.

Anderson, D. 1976. Paradichlorobenzene: Estimation of its mutagenic potential in the Salmonella typhimurium plate incorporation mutagenicity assay. Unpublished report: Imperial Chemical Industries Ltd, Central Toxicology Laboratory, Alderley Park, Macclesfield, Cheshire, V.K. (cited in Loeser and Litchflied, 1983).

Anderson, D. and Hodge, M.C.E. 1976. Paradichlorobenzene: Dominant lethal study in the mouse. Unpublished report: Imperial chemical Industries Ltd., Central Toxicology Laboratory, Alderly Park, Macclesfield, Cheshire, U.K. (cited in Loeser and Litchfield, 1983).

Anderson, D. and Richardson, C.R. 1976. Paradichlorobenzene: Cytogenetic study in the rat. Unpublished report: Imperial chemical Industries Ltd., Central Toxicology Laboratory, Alderly Park, Macclesfield, Cheshire, UK (cited in Loeser and Litchfield, 1983).

Andersen, K.J., Leighty, E.G. and Takahashi, M.T. 1972. Evaluation of herbicides for possible mutagenic properties. J. Agric. Food Chem. 20(3): 649-656.

Azouz, W.M., Parke, D.V. and Williams, R.T. 1955. Studies in detoxication. The metabolism of halogenobenzenes. Ortho and para-dichlorobenzenes. Biochem. J. 59(3): 410-415.

Brodzinsky, R. and Singh, H.B. 1982. Volatile organic chemicals in the atmosphere: an assessment of available data. Contract No. 68-02-3452. Environ. Sci. Res. Lab., ORD, U.S. EPA, Research Triangle Park, NC. (Cited in EPA, 1985.)

Carey, G.P. and McDonough, E.S. 1943. On the production of polyploidy in Allium with paradichlorobenzene. Jour. of Hereditary. 34:238.

Cotter, L.H. 1953. Case Reports: Paradichlorobenzene poisoning from insecticides. N.Y. State J. Med. 53: 1690-1692.

Downing, J.G. 1939. Dermatitis from orthodichlorobenzene. JAMA 112:1457.

Elkins, H.B. 1959. The Chemistry of Industrial Toxicology. New York: John Wiley and Sons, Inc.

Frank, S.B. and Cohen, H.J. 1961. Fixed drug eruption due to paradichloro-benzene. New York J. Med. 61:4079.

Gadrat, J., Monnier, J., Ribet, A and Bourse, R. 1962. Acute hemolytic anemia in a female worker of a dyeing and dry-cleaning shop exposed to inhalation of chlorobenzenes. Arch. Maladies Prof. Med. Travail Secrite Sociale. 23 (10/11):710-174 (Fre). (Cited in EPA, 1985.)

Giavini, E., Broccia, M.L., Prati, M. and Vismara, C. 1986. Teratologic evaluation of p-dichlorobenzene in the rat. Bull. Environ. Contam. Toxicol. 37:164-168.

Girard, R., Tolot, F., Martin, P. and Bourret, J. 1969. Serious blood disorders and exposure to chlorine derivatives of benzene (A report of seven cases). J. Med. Lyon. 50(1164):771-773 (Fre.) (Cited in U.S. EPA, 1985.)

Guerin, M. and Cuzin, J. 1961. Skin tests on mice for determining the carcinogenic activity of cigarette smoke tar. Bull. de l'Assoc. Francais pour I'Etude du Cancer. 48:112 (Fre). (Cited in U.S. EPA, 1980.)

Hallowell, M. 1959. Acute hemolytic anemia following the ingestion of paradichlorobenzene. Arch. Dis. Child. 34: 74-75.

Hawkins, D.R., Chassequd, L.F., Woodhouse, R.N. and Cresswell, D.G. 1980. The distribution, excretion and biotransformation of p-dichloro (14C) benzene in rats after repeated inhalation, oral and subcutaneous doses. Xenobiotica. 10(2):81-95.

Haworth, S. Lawlor, T., Mortelmans, K., Speck W. and Zeiger, E. 1983. *Salmonellamutagenicity test results for 250 chemicals.* Environ. Mutagen. (Suppl.1.):34-142.

Hayes, W.C., Hanley, T.R. Jr., Gushow, T.S. Johnson, K.A. and John, J.A. 1985. Teratogenic potential of inhaled dichlorobenzenes in rats and rabbits. Fundam. Appl. Toxicol.5(1) 190-202.

Hollingsworth, R.L., Rowe, V.K., Oyen, F., Hoyle, H.R. and Spencer, H.C. 1956. Toxicity of paradichlorobenzene. Determinations on experimental animals and human subjects. Arch. Ind. Hlth. 14:138-147.

Hollingsworth, R.L., Rowe, V.K. Oyen, F., Torkelson, T.R. and Adams, I.M. 1958. Toxicity of o-dichlorobenzene. Studies on animals and industrial experience. Arch. Ind. Health. 17(19):180:187.

Hodge, M.C.E., Palmer, S., Wilson, J. and Bennett, I.P. 1977. Paradichlorobenzeneteratogenicity study in rats. Unpublished report: Imperial Chemical Industries Ltd., Central Toxicology Laboratory, Alderly Park, Macclesfield, Cheshire, UK. (cited in Loeser and Litchfield, 1983; Hayes et al., 1985).

IARC (International Agency for Research on Cancer). 1974. IARC monographs on the evaluation of the carcinogenic risk of chemicals to man. Vol 7: Some antithyroid and related substances, nitrofurans and industrial chemicals: Ortho and para-dichlorobenzenes. pp 231-244.

IARC (International Agency for Research on Cancer). 1982. IARC monographs on the evaluation of the carcinogenic risk of chemicals to man. Vol. 29: Ortho-and paradichlorobenzenes pp 213¬218.

IARC (International Agency for Research on Cancer). 1987. IARC monographs on the evaluation of carcinogenic risks to humans. Overall evaluations of carcinogencity: an updating of IARC monographs Volumes 1 to 42. Suppl 7. pp. 192-193.

Johnston, P., Hodge, V. and Slimak, K. 1979. Materials Balance-Task 4-Chlorobenzenes. (EPA-560/13-80-001). Washington, D.C. U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances, pp. 2-19 - 3-10.

Kimura, R., Hayashi, T., Sato, M., Aimoto, T. and Murata, T. 1979. Identification of sulfur-containing metabolites of p-dichlorobenzene and their distribution in rats. J. Pharm. Dyn. 2(4):237-244.

Kimura, R., Kawai, M., Kato, Y., Sato, M., Aimoto, T. and Murata, T. Role of 3,5-dichloromethylsulfone, a metabolite of m-dichlorobenzene, in the induction of hepaticmicrosomal drug-metabolizing enzymes by m-dichlorobenzenes in rats. Toxicol. Appl. Pharmacol. 78(2):300-309.

Lawlor, T., Haworth, S.R. and Boytek, P. 1979. Evaluation of the genetic activity of nine chlorinated phenols, seven chlorinated benzenes, and three chlorinated hexanes (Abstract no. Ca¬10). Environ. Mutagenesis. 1:143.

NTP (National Toxicology Programme) 1985. Toxicology and Carcinogenesis Studies of 1,2-Dichlorobenzene (o-Dichlorobenzene). (CAS No. 95-50-1) in F344/N Rats and B6C3F1 Mice (Gavage Studies) (NTP TR 255; NIH. Publ. No. 86-2511), Research Triangle Park, NC.

NTP (National Toxicology Program). 1987. Toxicology and Carcinogenesis Studies of 1,4-Dichlorobenzene (CAS No. 106-46-7) in F344/N Rats and B6C3F1 mice (Gavage Studies) (NTP TR No. 319; NIH Publ. No. 87-2575), Research Triangle Park. (Cited in IARC 1987).

Parsons, D.L. 1942. On early tumour formation in pure-line mice treated with carcinogenic compounds and the associated blood and tissue chang J. Path. Bact. 54:321-330.

Perrin, M. 1941. Possible harmfulness of paradichlorobenzene used as a moth killer. Bull. de l'Acad. de Med. 125:302.

Perocco, P. Bolognesi, S. and Alberghini, W. 1983. Toxic activity of seventeen industrial solvents and halogenated compounds on human lymphocytes cultured in vitro. Toxicol. Lett. 16:69-75.

Petit, G. and Champeix, J. 1948. Does an intoxication caused by paradichlorobenzene exist? Arch. Malad. Profess. Med. 9:311-312. (Cited in EPA, 1985.)

Poland, A. Goldstein, J., Hickman, P. and Burse, V.W. 1971. A reciprocal relationship between the induction of aminolevulinic acid synthetase and drug metabolism produced by m-dichlorobenzene. Biochem. Pharmacol. 20(6):1281-1290.

Prasad, I. 1970. Mutagenic effects of the herbicide 3', 4'-dichloroproprionanilide and its degradation products. Can. J. Microbiol. 16:369-372.

Reid, W.D. and Krishna, G. 1973. Centrilobular hepatic necrosis related to covalent binding of metabolites of halogenated aromatic hydrocarbons. Ex. Mo. Pathol. 18:80-99.

Riedel, H. 1941. Einge beobachtungen uber orthodichlorobenzol. Arch. Gewerbepath. Bewerbehyg. 10:546-549. (Cited in EPA, 1985).

Riley, R.A., Chart, I.S. Doss, A., Gore, C.W., Patton, D. and Weight, T.M. 1980a. Paradichlorobenzene: Long term inhalation study in the rat. Unpublished report: Imperial Chemical Industries Ltd., Central Toxicology laboratory, Alderly Park, Macclesfield, Cheshire, U.K. (Cited in Loeser and Litchfield, 1983.)

Riley, R.A. Chart, I.S., Gaskell, B. and Gore, C.W. 1980b. Para-dichlorobenzene: Long term inhalation study in the mouse. Unpublished report: Imperial Chemical Industries Ltd., Central Toxicology Laboratory, Alderly Park, Macclesifled, Cheshire,U.K. (Cited in Loeser and Litchfield, 1983).

Rimington, C. and Ziegler, G. 1963. Experimental porphyria in rats induced by chlorinated benzene. Biochem. Pharmacol. 12:1387-1397.

Shackelford, W.M. and Keith, L.H. 1976. Frequency of Organic Compounds Identified in Water. (EPA-600)/4-76-062), Athens GA, Environmental Research Laboratory, U.S.Environmental Protection Agency, pp. 37, 72, 76-77.

Sharma, A.K. and Bhattacharyya. 1956. Chromosome breakage through paradichlorobenzene treatment. Cytologia 21:353-360.

Sharma, A.K. and Sarkar, S.K. 1957. A study on the comparative effect of chemicals on chromosomes of roots, pollen mother cells and pollen grains. Proc. Indian Acad. Sci. Sect. B. 45(6):288-293.

Srivastava, L.M. 1966. Induction of mitotic abnormalities in certain genera of tribe Vicieae by paradichlorobenzene. Cytologia, 31:166-171. U.S. EPA (U.S. Environmental Protection Agency) 1985. Health Assessment Document for Chlorinated Benzenes. Cincinnati, OH: Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, Office of Research and Development.

Sumers, J., Fuhrman, M. and Kelman, A. 1952. Hepatitis with concomitant esophageal varices following exposure to moth ball vapors. N.Y. State J. Med 52:1048-1049.

U.S. EPA (U.S. Environmental Protection Agency) 1980. Ambient Water Quality Criteria for Dichlorobenzenes. Washington, D.C.: Office of Water Regulations and Standards, Criteria and Standards Division.

U.S. EPA (U.S. Environmental Protection Agency) 1985. Health Assessment Document for Chlorinated Benzenes. Cincinnati, OH: Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, Office of Research and Development.

Ware and West, 1977.

1,2-DICHLOROETHANE REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR), U.S. Public Health Service, 1989. Toxicolgocial Profile for 1,2-Dichloroethane·

Alumot E, Nachtomi E, Mandel E, et al. 1976. Tolerance and acceptable daily intake of chlorinate fumigants in the rat diet. Food Cosmet Toxicol 14:105-110.

Austin SB, Schnatter AR. 1983a. A case-control study of chemical exposures and brain tumors in petrochemical workers. J Occup med 25:313-320.

Austin SG, Schnatter AR. 1983b. A cohort mortality study of petrochemical workers. J Occup Med 25:304-312.

Brondeau GR, Bonnet P, Guenier JP, et al. 1983. Short-term inhalation test for evaluating industrial hepatotoxicants in rats. Toxicol Lett 19:139-146.

Drinking Water and Health. 1977. 1980. National Academy of Sciences. National Academy of Sciences. Printing and Publishing Offices, Washington, D.C.

Garrison SC, Leadingham RS. 1954. A fatal case of ethylene dichloride poisoning in an occupational therapy department of a neuropsychiatric hospital. Am J Phys Med 33:230-237.

Heppel LA, Neal PA, Perin TL, et al. 1945. The toxicology of 1,2 dichloroethane(ethylene). III. Its acute toxicity and the effect of protective agents. J. Pharmacol Exp Ther 84:53-63.

Heppel LA, Neal PA, Perrin TL, et al. 1946. The toxicology of 1,2-dichloroethane (ethyldichloride). V. The effects of daily inhalations. J Ind Hyg Toxicol 28:113-120.

Hofmann HT, Birnsteil H, Jobst P. 1971. Zur inhalations toxicant von 1,1-and 1,2-dichloroathan. Arch Toxikol 27:248-265. (German)

Hogstedt C, Rohlen O, Berndtsson BS, et al. 1979. A cohort study of mortality and cancer incidence in ethylene oxide production workers. Br J Ind Med 36:276-280.

Hueper WC, Smith C. 1935. Fatal ethylene dichloride [sic] poisoning. Am J Med Sci 189:778-784.

Isacson P, Bean JA, Splinter R, et al. 1985. Drinking water and cancer incidence in Iowa. III. Association of cancer with indices of contamination. Am J Epid 121:856-869.

Kavlock R, Chernoff N, Carver B, et al. 1979. Teratology studies in mice exposed to municipal drinking-water concentrates during organogenesis. Food Cosmet Toxicol 17:343-347.

Klaassen, C D, Amdur, M D and Doull, J, eds. 1986. Casarett and Doull's Toxicology, The Basic Science of Poison, Third Edition. Macmillan Publishing Company, New York, New York.

Lane RW, Riddle BL, Borzelleca JF. 1982. Effects of 1,2-dichloroethane and 1,1,1-trichloroethane in drinking water on reproduction and development in mice. Toxicol Appl Pharmacol 63:409-421.

Lochhead HB, Close HP. 1951. Ethylene dichloride plastic cement: A case of fatal poisoning. JAMA 146: 1323.

Maltoni C, Valgimigli L, Scarnato C. 1980. Long-term carcinogenic bioassays on ethylene dichloride administered by inhalation to rats and mice. IN: Ames BN, Infante P,Reitz R, ed. Ethylene Dichloride: A Potential Health Risk? Banbury Report No. 5. cold Spring Harbor, NY: Cold Spring Harbor Laboratory, 3-33.

McCollister DD, Hollingsworth RL, Oyen F, et al. 1956. Comparative inhalation toxicity of fumigant mixtures. Individual and joint effects of ethylene dichloride, carbon tetrachloride, and ethylene dibromide. Arch Ind Health 13:1-7.

Munson AE, Sanders VM, Douglas KA, et al. 1982. In vivo assessment of immunotoxicity. Environ Health Perspect 43:41-52.

NCI. 1978. Bioassay of technical grade 1,2-dichloroethane for possible carcinogenicity. Bethesda, MD: National Cancer Institute, Division of Cancer Cause and Prevention,Carcinogenesis Testing Program. NCI-CG-TR 55.

Nouchi T, Miura H, Kanayama M, et al. 1984. Fatal intoxication by 1,2-dichloroethane--A case report. Int Arch Occup Environ health 54: 111-113.

PCOG. 1966. Pesticide chemicals official compendium. Association of American Pesticide Control Officials, Inc., Topeka, KS.

Przezdziak J, Bakula S. 1975. [Acute poisoning with 1,2-dichloroethane.] Wiad Lek 28:983-987. (Polish)

Rao KS, Murray JS, Deacon MM, et al. 1980. Teratogenicity and reproduction studies in animals inhaling ethylene dichloride. IN: Ames B, Infante P, Reitz R, ed. Ethylene Dichloride: A Potential Health Risk? Banbury Report No. 5. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory, 149-166.

Reeve GR, Bond GG, Lloyd JW, et al. 1983. An investigation of brain tumors among chemical plant employees using a sample-based cohort method. J Occup Med 25:387-393.

Schonborn H, Prellwitz W, Baum P. 1970. {Consumption coagulation pathology of 1,2-dichloroethane poisoning.] Klin Wochenschr 48:822-824. (German)

Sherwood RL, O'Shea W, Thomas PT, et al. 1987. Effects of inhalation of ethylenedichloride on pulmonary defenses of mice and rats. Toxicol Appl Pharmacol 91:491-496.

Spencer HC, Rowe VK, Adams EM, et al. 1951. Vapor toxicity of ethylene dichloride determined by experiments on laboratory animals. AMA Arch Ind Hyg Occup Med 4:482-493.

Storer RD, Jackson NM, Conolly RB. 1984. In vivo genotoxicity and acute hepatotoxicity of 1,2-dichlorethane in mice: Comparison of oral, intraperitoneal, and inhalation routes of exposure. Cancer Res 44:4267-4271.

Vozovaya M. 1977. [The effect of dichloroethane on the sexual cycle and embryogenesis of experimental animals.] Akusk Ginekol (Mosco) 2:57-59. (Russian)

Waxweiler RJ, Alexander V, Leffingwell SS, et al. 1983. Mortality from brain tumor and other causes in a cohort of petrochemical workers. JNCI 70:75-81.

Yodaiken RE, Babcock JR. 1973. 1,2-Dichloroethane poisoning. Arch Environ health 26:281-284.

U.S. Environmental Protection Agency. 1985. Health Assessment Document for 1,2-Dichloroethane. Prepared by the office of Health and Environmental Assessment,Environmental Criteria and Assessment Office, Research Triangle Park, NC. EPA 600/8-34-006F.

U.S. Environmental Protection Agency Integrated Risk Information System (IRIS), 1,2-Dichloroethane, 1989.

BIS[2-ETHYLHEXYL] PHTHALATE REFERENCES

Carpenter G.P., C.S. Weil and H.F. Smythe 1953. Chronic oral toxicity of bis(2-ethylhexyl) phthalate for rats and guinea pigs and dogs. Ata Indust. Hyg. Occup. Med 8:219-226.

NTP, 1982. Carcinogenesis bioassay of bis(2-ethylhexyl) phthalate (CAS No. 117-81-7) in F344 rats and B6C3F1 mice (feed study). NTP Tech. Report Ser. TR No. 217, NTP Research Triangle Pack, N.C.

NTP 1984. Bis(2-ethylhexyl) phthalate: reproduction and fertility in CD-1 mice when administered by gavage. Final Report NTP 84-079. NTP, Research Triangle Park, N.C.

Shiota K. and H. Nishimura 1982. Teratogenicity of bis(2-ethylhexyl) phthalate and di(n-butyl) phthalate in mice. Envirn, Health Respect 45:65-70.

Singhe, A.R. W.H. Lawrence and J. Autian 1972. Teratogenicity of phthalate esters in rats J. Pharmacol Sci 61:51.

TRICHLOROETHYLENE REFERENCES

Blair, A, Decoufle, P, Grauman, D. 1979. Causes of death among laundry and dry cleaning workers. Am J Pub Health; 695087-511.

Kjellstrand, P, Holmquist, B, Alm, P, Kanje, M, Romare, S, Jonsson, I, Mannson, L, Bjerkamo, M. 1983. Trichloroethylene: Further studies of the effects on body and organ weights and plasma butyryl cholinesterase activity in mice. Acta Pharmacol Toxiccol; 53:375-384.

Kyrklund, T, Kjellstrand, P, Haglid, KG. 1985. The development and rehabilitation of changes among polyunsaturated fatty acids in cerebral cortex ethanolamine phosphoglycerate, following exposure of rats to trichloroethylene. Acta Neuro Scan; 72(2):264.

Maltoni, C. Lafemine, G, Cotti, G et al 1986. Experimental Research on Trichloroethylene Carcinogenesis. Archiv. Res. Industrial Carcinogenesis Series. Maltoni, C, Mehlman MA, eds., Vol. V., Princeton Scientific Publishing co., Inc., Princeton, NJ; p. 393. (Cited in EPA 1987a).

Mazza, V, Brancaccio, A. 1967. Characteristics of the formed elements of the blood and bone marrow in experimental trichloroethylene intoxication. Folia Med; 50:318-324. (Cited in EPA1985b)

Nomiyama, K, Nomiyama, H. 1974. Respiratory retention, uptake, and excretion of organic solvents in man. Int Arch Arbeitsmed; 32:75-83.

Simmon, VF, Kauhanen, K, Tardiff, RG. 1978. Mutagenic activity of chemicals identified in drinking water. Pp 249-264 in Scott, D, Bridges, BA, Sobels, FH, eds., Progress in Genetic Toxicology: Proceedings of the 2nd International Conference on Environmental Mutagens, Edinburgh. Elsevier/North-Holland, New York.

Sorgo, G. 1976. Trichloroethylene, carbon tetrachloride, and gasoline intoxication asetiological factors in the development of arterio and coronary sclerosis. Arch Toxicol; 35:295-318. (Ger.) (Cited in WHO 1985).

Stott WT, Quast JF, Watanabe PG. 1982. Pharmacokinetics and macromolecular interactions of trichloroethylene in mice and rats. Toxicol Appl Pharmacol; 62-137-151.

TETRACHLOROETHYLENE REFERENCES

Abedin, Z., Cook, R.C., and Milberg, R.M., 1980. Cardiac toxicity of PP perchloroethylene (a dry cleaning agent). Southern Med J; 73(8): 1081-1083.

Aranyi, C., O'Shea, W.J., Graham, J.A., and Miller, F.J., 1986. The effects of inhalation of organic chemical air contaminants on murine lung host defenses. Fund Appl Toxicol; 6(4):713-720.

Blari, A., Docoufle, P., and Grauman, D., 1979. Causes of death among laundry and dry cleaning workers. Am J Pub Health; 69:508-511.

Briving, C., Jacobson, I., Hamberger, A., Kjellstrand, P., Haglid; K.G., and Rosengren, L.E., 1986. Chronic effects of perchloroethylene and trichloroethylene on the gerbil brainamino acids and glutathione. Neurotoxicologist; 7(1):101-108.

Brown, D.P., and Kaplan, S.D., 1985. Retrospective cohort mortality study of dry cleaner workers using perchloroethylene. Cincinnati, OH: NIOSH, U.S. Department of Health and Human Services.

Buben, J.A., and O'Flaherty, E.F., 1985. Delineation of the role of metabolism in the hepatotoxicity of trichloroethylene and perchloroethylene: A dose effect study. Toxicol Appl Pharmacol; 78(1):105-122.

Carpenter, C.P., 1937. The chronic toxicity of tetrachloroethylene. J. Ind Hyg Toxicol;19:323-336.

Duh, R.W., and Asal, N.R., 1984. Mortality among laundry and dry-cleaning workers in Oklahoma Am J. Public Health; 74(11):1278-1280.

Ghantous, H., Danielsson, B.R.G., Dencker, L., Gorczak, J., and Versterberg O., 1986.Trichloroacetic acid accumulates in murine amniotic fluid after tri- and tetrachloroethylene inhalation. Acta Pharmacol Toxicol; 58:105-114.

Goldberg, M.E., Johnson, H.E., Pozzani, U.C., and Smyth, H.F., 1964. Effect of repeated inhalation of vapors of industrial solvents on animal behavior. I. Evaluation of nine solvent vapors on pole-climb performance in rats. Am Ind Hyg Assoc J; 25:369-375.

Hake, C.L., and Stewart, R.D., 1977. Human exposure to tetrachloroethylene: in halation and skin contact. Environ Health Persp; 21:231-238.

Hara, M., Kino, M., Yamamoto, et al., 1985. Cardiovascular effects of organic solvents(perchloroethylene) (PERC). Jap Circ J; 49(8):887-888. (Abstract).

Hayes, J.R., Condie, L.W., and Borzelleca, J.F., 1986. The subchronic toxicity of tetrachloroethylene (perchloroethylene) administered in the drinking water of rats. Fund Appl Toxicol; 7(1):119-125.

Ideda, M., Koisumi, A., Watanabe, T., Endo, A., and Sato, K., 1980. Cytogenetic and cytokinetic investigations on ymphoytes from workers occupationally exposed to tetrachloroethylene. Toxicol Lett; 5:251 -256.

Kaplan, S.D., 1980. Dry-Cleaner Workers Exposed to Perchloroethylene. A Retrospective Cohort Mortality Study. U.S. DHEW Contract No. 210-77-0094. Cincinnati, OH:NIOSH. (Cited in IARC 1982).

Katz, R.M., and Jowett, D., 1981. Female Laundry and dry-cleaning workers in Wisconsin. a mortality analysis. Am J Pub Health; 71:305-307.

Kjellstrand, P., Holmquist, B., Kanje, M., et al., 1984. Perchloroethylene: Effects on body and organ weights and plasma butyrylcholinesterase activity in mice. Acta Pharmacol Toxicol; 54(5):414-424.

Kobayashi, S., Hutcheon, D.E., and Regan, John, 1982. Cardiopulmonary Toxicity of Tetrachloroethylene. J Toxicol Environ Health; 10:23-30.

Koppel, C., Arndt, I., Arendt, U., Koeppe, P., 1985. Acute tetrachloroethylene poisoning:Blood elimination kinetics during hyperventilation therapy. J Toxicol Clin Toxicol; 23(2-3):103-116.

Kylin, B., Reichard, H., Sumegi, I., and Yllner, S., 1963. Hepatotoxicity of inhaled trichloroethylene, tetrachloroethylene, and chloroform-single exposure. Acta Pharmacol Toxicol; 20:16-26. (Cited in EPA 1985a)

Kyrklund, T., Alling, C., Kjellstrand, P., and Haglid, K.G., 1984. Chronic effects of perchloroethylene on the composition of lipid and acyl groups in cerebral cortex and hippocampus of the gerbil. Toxicol Lett; 22:343-349.

Larson, N.A., Nielsen, B., and Ravin-Nielsen, A., 1977. Perchloroethylene intoxication-a hazard in the use of coin laundries. Ugeskr Laeg; 3995:270-275. (English translation)(Cited in EPA 1985a).

Levine, B., Fierro, M.F., Goza, S.W., and Valentour, C., 1981. A tetrachloroethylene fatality. J. Forensic Sci; 26:206-209. (Cited in EPA 1985a).

Lukaszewski, T., 1979. Acute tetrachloroethylene fatality. Clin. Toxicol. 15(4): 411-415.

NCI (National Cancer Institute). 1977. Bioassay of tetrachloroethylene for possible carcinogenicity. Bethesda, MD: U.S. Department of Health, Education and Welfare, Public Health Service, National Institutes of Health. DHEW Pub. No. (NIH) 77-813.

NTP (National Toxicology program). 1986. Toxicology and carcinogenesistetrachloroethylene (perchloroethylene) (CAS No. 127-184) in F344/N rats and B6C3F1 mice (inhalation studies). Natl. Toxicol. Program Tech. Rep. Serv. Issue. 311.

Rampy, L.W., Quast, J.F., Balmer, M.F., Leong, B.K.J., and Gehring, P.J., 1978.Results of a long-term inhalation toxicity study. Perchloroethylene in rats. Toxicology Research Laboratory, Health and Environmental Research, The Dow Chemical Company,Midland, MI. Unpublished. (Cited in EPA 1985a).

Reinhardt, C.F., Mullin, L.S., and Maxfield, M.E., 1973. Epinephrine-induced cardiacarrhythmia potential of some common industrial solvents. J Occup Med; 15(12):953-955.

Rosengren, L.E., Kjellstrand, P., and Haglid, K.G., 1986. Tetrachloroethylene: levels of KNA and S-100 in the gerbil CNS after chronic exposure. Neuro behave Toxicol Teratol; 8(2):201-206.

Rowe, V.K., McCollister, D.D., Spencer, H.C., Adams, E.M., and Irish, D.D., 1952. Vapor toxicity of tetrachloroethylene for laboratory animals and human subjects. AMA Arch Ind Hyg Occup Med; 5:566-579.

Savolainen, H., Pfaffli, P., Tengen, M., and Vainio, H. 1977. Biochemical and behavioral effects on inhalation exposure to tetrachloroethylene and dichloromethane. J Neuropath Exp Neurology; 36:941-949.

Schwetz, B.A., Leong, B.K.J., and Gehring, P.J., 1975. The effect of maternally inhaled trichloroethylene, perchloroethylene, methylchloroform, and methylene chloride on embryonal and fetal development in mice and rats. Toxicol Appl Pharmacol; 32:84-96.

Stewart, R.D., Baretta, E., Dod, H.C., Torkelson, T.R., 19970. Experimental human exposure to tetrachloroethylene. Arch Environ Health; 20:224-229.

Stewart, R.D., Hake, C.L., Wu, A., et al. 1977. Effects of perchloroethylene/drug interaction behavior and neurological function. Final report. Washington, DC: NIOSH.(Cited in EPA 1985a).

U.S. Public Health Service, Agency for Toxic Substances and Disease Registry, 1989. Toxicological Profile for Tetrachloroethylene. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Van Duuren, B.L., Goldschmidt, M., Loewengart, G., Smith, C., Melchione, S.,Seidman, I., and Roth, D., 1979. Carcinogenicity of halogenated olefinic and aliphatichydrocarbons in mice. JNCI;63:1433-1439.

Wenzel, D.G., and Gibson, R.D., 1951. Toxicity and anthelminthic activity of n-butylidene chloride. J Pharm Pharmacol; 3:169-176. (Cited in EPA 1985a).

TRIHALOMETHANE REFERENCES

Carlo, GL and Mettlin, CJ. 1980. Cancer Incidence and Trichloromethane Concentrations in a Public Water System. Am. J. Public Health. 7:523-25

Crump, KS and Quess, HA. 1982. Drinking Water and Cancer: Review of Recent Epidemiological Findings and Assessment of Risks. Ann. Rev. Public Health. 3: 339-357.

Gottlieb, MS, Carr, JK, Clarkson, JR. 1980. Drinking Water and Cancer in Louisiana. Mortality Stuly. Prepared for Health Effects Research Research Laboratory, U. S. Environmental Protection Agency, Cincinnati, Ohio. Submitted for publication.

Gottlieb, MS, Carr, JK, Mirris, DT. 1981. Cancer and Drinking Water in Louisiana: Colon and rectum. Intl. J. Epidemiol. 10:117-25.

Jorgenson, TA, Meierhenry, EF, Rushbrook, CJ, et al. 1985. Carcinogenicity of Chloroform in Drinking Water to Ma'e Osborne-Mendel Rats and Female B6C3F1 Mice. Fund. Appl. Toxicol. (USA) 5(4): 760-769.

Kanarek, MS and Young, TB. 1980. Drinking Water Chlorination and Female Cancer in Wisconsin. 1961-1977. Prepared for Health Effects Research Laboratory, U. S.Environmental Protection Agency, Cincinnati, Ohio.

National Cancer Institute (NCI). 1985. Cancer Rates and Risks. NIH Publication No. 85-691.

Schwetz, BA, Leong, BKJ, Gehring, PJ. 1974. Embryo and Fetotoxicity of Inhaled Chloroform in Rats. Toxicol. Appl. Pharmacol. 28: 442-451.

Sittig, M. 1985. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2nd ed. Noyes Publications, Park Ridge, New Jersey.

Roe, FLC, Palmer, AAK, Worden, AN, Van Abbe, NJ. 1979. Safety Evaluation of Toothpaste Containing Chloroform. I. Long-term Studies in Mice. J. Environ. Toxicol. 2: 799-819.

Viessman, W and Hammer, MJ. 1985. Water Supply and Pollution Control, 4th ed. Harper and Row Publishers. New York, New York.

Zierlier, S, Feingold, L, Danley, RA, and Craun, G. 1988. Bladder Cancer in Massachusetts Related to Chlorinated Drinking Water: A Case-Control Study. Archives of Environmental Health. 43(2).

U.S. Environmental Protection Agency, Agency for Toxic Substances and Disease Registry (ATSDR). 1989. Toxicological Profile for Chloroform.

U. S. Environmental Protection Agency, Integrated Risk Information System (IRIS). 1989. Chloroform.

IRIS 1989. Dibromochloromethane.

IRIS 1989. Bromoform.

IRIS 1989. Bromodichloromethane.

PHENOL REFERENCES

Dow Chemical Co. 1945. The toxicity of phenol. Biochem. Res. Lab. Unpublished report.

National Cancer Institute (NCI). 1980. Bioassay of phenol for possible carcinogenicity in F344 rats and B6C3F1 mice. NIH Publ. No. 80-1759. August 1980.

National Toxicology Program (NTP). 1983. Teratologic evaluation of phenol in CD rats and mice. Report prepared by Research Triangle Institute, Research Triangle Park, NC. NTIS PB83-247726. Gov. Rep.Announce. Index. 83(25):6247.

Sittig, M. 1985. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2nd ed. Noyes Publications, Park Ridge, New Jersey.

U.S. Environmental Protection Agency, Integrated Risk Information System (IRIS). 1990. Phenol.

TOLUENE REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR), U.S. Public Health Service. 1989. Toxicological Profile for Toluene.

Anderson HR, Macnair RS, Ramsey JD. 1985. Epidemiology: Deaths from abuse of volatile substances: A national epidemiological study. Br Med J 290:304-307.

Andersson R, Carlsson A, Nordqvist MB, et al. 1983. Urinary excretion of hippuric acid and o-cresol after laboratory exposure of humans to toluene. Int Arch Occup Environ Health 53:101-108.

API. 1981. American Petroleum Institute. Mutagenicity evaluation of toluene in the mouse dominant lethal assay. Litton Bionetics, Inc. Proj. no. 21141-05. Final report.

API. 1985. American Petroleum Institute. Two-generation reproduction/fertility study on a petroleum-derived hydrocarbon (i.e.,) toluene [Volume 1].

Aranyi C, OShea WJ, Sherwood RL, et al. 1985. Effects of toluene inhalation on pulmonary host defenses of mice. Toxicol Lett 25:103-110.

Banfer W. 1961. Studies on the effect of pure toluene on the blood picture of photograture printers and helper workers. Zentral fur Arbeitsmed 11:35-40.

Bauchinger M, Schmid E, Dresp J, et al. 1982. Chromosome change in lymphocytes after occupational exposure to toluene. Mutat Res 102:439-445.

Bruckner JV, Peterson RG. 1981a. Evaluation of toluene and acetone inhalant abuse. I. Pharmacology and pharmacodynamics. Toxicol Appl Pharmacol 61:27-38.

Bruckner JV, Peterson RG. 1981b. Evaluation of toluene and acetone inhalant abuse. II. Model development and toxicology. Toxicol Appl Pharmacol 61:302-312.

Capellini A, Alessio L. 1971. The urinary excretion of hippuric acid in workers exposed to toluene. Med Lavoro 62:196-201.

Carpenter CP, Smyth HF. 1946. Chemical burns of the rabbit cornea. Am J Ophthalmo 129:1363-1372.

Carpenter CP, Geary DL, Myers RC, et al. 1976. Petroleum hydrocarbon toxicity studies. XIII. Animal and human response to vapors of toluene concentrate. Toxicol Appl Pharmacol 36:473-490.

CIIT. 1980. Chemical Industry Institute of Toxicology. A twenty-four month inhalation toxicology study in Fischer-344 rat exposed to atmospheric toluene. Executive Summary and Data Tables. Conducted by Industrial Bio-Test Laboratories, Inc., Decatur, IL, and Experimental Pathology Laboratories, Inc., Raleigh, NC for CIIT, Research Triangle Park,NC. October 15, 1980.

Courtney KD, Andrews JE, Springer J, et al. 1986. A perinatal study of toluene in CD-1 mice. Fundam Appl Toxicol 6:145-154.

Devathasan G, Low D, Teoh PC, et al. 1984. Complications of chornic glue (toluene) abuse in adolescents. Aust NZ J Med 14:39-43.

Goodwin TM. 1988. Toluene abuse and renal tubular acidosis in pregnancy. Obstet Gynecol 71:715-718.

Greenburg L, Mayers MR, Heimann H, et al. 1942. The effects of exposure to toluene in industry. J Am Med Assoc 118:573-578.

Haglund U, Lundberg I, Zech L. 1980. Chromosome aberrations and sister chromatic exchanges in Swedish paint industry workers. Scan J Environ Health 6:291-298.

Hanninen H, Eskelinen L., Husman K, et al. 1976. Behavioral effects of long-term exposure to a mixture of organic solvents. Scand J Work Environ Health 4:240-255.

Hartmann RJ, Gause EM, Mendez V, et al. 1984. Effect of exposure to toluene and ethanol alone or in combination on a match-to-sample discrimination task in the juvenile baboon. Proc West Pharmacol Soc 27:251-253.

Hazleton Laboratories. 1962. Acute eye application - albino rabbits. ESSO Research and Engineering Company. Falls Church VA.

Holmberg PC. 1979. Central nervous system defects in children born to mothers exposed to organic solvents during pregnancy. Lancet 2:177.

Honma T, Miyagawa M, Sato M, et al. 1982. Increase in glutamine content of ratmid brain induced by short-term exposure to toluene and hexane. Ind Health 20:109-115.

Ikeda M, Koizumi A, Kasahara M, et al. 1986. Combined effects of n-hexane and toluene on norepinephrine and dopamine levels in rat brain tissues after long-term exposure. Bull Environ Contam Toxicol 36:510-517.

Iregren A. 1986. Subjective and objective signs of organic solvent toxicity among occupationally exposed workers. Scand J Work Environ Health 12:469-475.

Kimura ET, Ebert DM, Dodge PW. 1971. Acute toxicity and limits of solvent residue for sixteen organic solvents. Toxicol Appl Pharmacol 19:699-704.

Kronevi T, Wahlberg J, Holmberg B. 1979. Histopathology of skin, liver, and kidney after epicutaneous administration of five industrial solvents to guinea pigs. Environ Res 19:56-69.

Kyrklund T, Kjellstrand P, Haglid K. 1987. Brain lipid changes in rats exposed to xylene and toluene. Toxicology 5:123-133.

Lundberg I, Hakansson M. 1985. Normal serum activities of liver enzymes in Swedish paint industry workers with heavy exposure to organic solvents. Br J Ind Med 42:596-600.

Maki-Paakkanen J, Husgafvel-Pursiainen K, Kalliomaki PL, et al. 1980. Toluene-exposed workers and chromosome aberrations. J Toxicol Environ Health 6:775-781.

Moszcynski P, Lisiewicz J. 1984. Occupational exposure to benzene, toluene and xylene and the T lymphocyte functions. Haematologia 17:449-453.

NTP 1989. NTP technical report on the toxicology and carcinogenesis studies of tolune (CAS No. 108-88-3) in F344/N rats and B6C3F1 mice. NIH publications no. 89-2826.

Parmeggiani L, Sassi C. 1954. Occupational risk of toluene: environmental studies and clinic investigations of chrome intoxication. Med Lavoro 45:574-587.

Pryor GT, Dickinson J, Feeney E, et al. 1984a. Hearing loss in rats first exposed to toluene as weanlings or as young adults. Neurobehav Toxicol Teratol 6:111-119.

Pryor GT, Rebert CS, Dickinson J, et al. 1984b. Factors affecting toluene-induced to toxicity in rats. Neurobehav Toxicol Teratol 6:223-238.

Schmid E, Bauchinger M, Hauf R. 1985. Chromosome changes with time inlymphocytes after occupational exposure to toluene. Mutat Res 142:37-39.

Seidenberg JM, Becker RA. 1987. A summary of the results of 55 chemicals screened for developmental toxicity in mice. Teratogen Carcinogen Mutagen 7:17-28.

Seiji K, Inoque O, Nakatsuka H, et al. 1987. No biologically significant changes in liver function after occupational exposure to toluene at over-OEL levels. Ind Health 25:163-168.

Smith KN. 1983. Determination of the reproductive effects in mice of nine selected chemicals. Bioassay Systems Corporation. NIOSH Contract No. 210-81-6011. BSC Project No. 10867.

Smyth HF, Weil CS, West JS, et al. 1969. An exploration of joint toxic action: Twenty-seven industrial chemicals incubated in rats in all possible pairs. Toxicol Appl Pharmacol 14:340-347.

Suleiman SA. 1987. Petroleum hydrocarbon toxicity in vitro: effect of n-alkanes,benzene and toluene on pulmonary alveolar macrophges and lysosomal enzymes of the lung. Arch Toxicol 59:402-407.

Tahti H, Karkkainen S, Pyykko K, et al. 1981. Chronic occupational exposure to toluene. Int Arch Occup Environ Health 48:61-69.

U. S. Environmental Protection Agency (EPA). 1985. Drinking water criteria document for toluene. Washington, D.C.: U.S. Environmental Protection Agency Office of Drinking Water. ECAO-CIN-408.

U.S. Environmental Protection Agency, Integrated Risk Information System (IRIS). 1989. Toluene.

U.S. Environmental Protection Agency, Health Effects Assessment Summary Tables (HEAST). 1989. Toluene.

Ungvary G, Tatrai E, Szeberenyi S, et al. 1982. Effect of toluene exposure on the liver under different experimental conditions. Exp Mol Pathol 36:347-360.

Ungvary G, Tatrai E. 1985. On the embryo toxic effects of benzene and its alkyl derivatives in mice, rats and rabbits. Arch Toxicol (Supplement) 8:425-430.

Ungvary G. 1985. The possible contribution of industrial chemicals (organic solvents) to the incidence of congenital defects caused by teratogenic drugs and consumer goods: An experimental study. In: Marois, M., ed. Prevention of physical and mental congenital defects. Part B: Epidemiology, early detection and therapy, and environmental factors. New York: Alan R. Liss, Inc. pp 295-300.

von Oettingen WF, Neal PA, Donahue DD, et al. 1942. The toxicity and potential dangers of toluene with special reference to its maximal permissible concentration. U.S. Public Health Service Publication Health Bull No. 279:50.

Wen CP, Tsai SP, Weiss NS, et al. 1985. Long-term mortality study of oil refinery workers. IV. Exposure to the lubricating-dewaxing process. J Natl Cancer Inst 74:11-18.

Wilson RH. 1943. Toluene poisoning. J Am Med Assoc 123:1106-1108.

Winchester RV, Madjar VM. 1986. Solvent effects on workers in the paint, adhesive and printing industries. Ann Occup Hyg 30:307-317.

Withey RJ, Hall JW. 1975. The joint toxic action of perchloroethylene with benzene or toluene in rats. Toxicology 4:5-15.

Wolf MA, Rowe VK, McCollister DD, et al. 1956. Toxicological studies of certain alkylated benzenes and benzene. AMA ARch Ind Health 14:387-398.

XYLENE REFERENCES

Agency for Toxic Substances and Disease Registry Integrated Risk Information System (IRIS). 1989.

Anderson K, Fuxe K, Nilsen OG, et al. 1981. Production of discrete changes in dopamine and noradrenaline levels and turnover in various parts of the rat brain following exposure to xylene, ortho-, meta-, and para-xylene,and ethylbenzene. Toxicol Appl Pharmacol 60:535-548.

Bio/dynamics Inc. 1983. File with FYI-AX-0982-0209: Parental and fetal reproduction toxicity study. EPA/OTS Public Files. Submitted by American Petroleum Institute. document No. FYI-AX-0983-0209.

Carpenter CP, Kinkead ER, Geary DJ, et al. 1975. Petroleum hydrocarbon toxicity studies. V. Animal and human response to vapors of mixed xylenes. Toxicol Appl Pharmacol 33:543-558.

De Caeurriz JC, Micillino JC, Bonnet P, et al. 1981. Sensory irritation caused by various industrial airborne chemicals. Toxicol Lett 9:137-143.

Dyer RS, Bercegeay MS, Mayo LM. 1988. Acute exposures to p-xylene and toluene alter visual information processing. Neurotoxicol Teratol 10:147-153.

Gamberale F, Annwall G, Hultengren M. 1978. Exposure to xylene and ethylbenzene: III. Effects on central nervous functions. Scand J. Work Environ Health 4:204-211.

Goldie I. 1960. Can xylene (xylol) provoke convulsive seizures. Ind Med Surg 29:33-35.

Hake CLR, Stewart RD, Wu A, et al. 1981. p-Xylene: Development of a biological standard for the industrial worker. Report to the National Institute for Occupational Safety and Health,Cincinnati, OH, by the Medical College of Wisconsin, Inc., Milwaukee, WI. PB82-152844.

Hazleton Labs. 1988a. Subchronic toxicity study in rats with m-xylene. Report by Hazleton Laboratories America, Inc., Rockville MD for Dynamac Corporation, Rockville, MD(unpublished).

Hazleton Labs. 1988b. Subchronic toxicity study in rats with p-xylene. Report by Hazleton Laboratories America, Inc., Rockville MD for Dynamac Corporation, Rockville, MD(unpublished).

Hine CH, Zuidema HH. 1970. The toxicological properties of hydrocarbon solvents. Industrial Medicine 39:39-44.

Hudak A, Ungvary G. 1978. Embryo toxic effects of benzene and its methyl derivatives: toluene, xylene. Toxicol 11:55-63.

Klaucke DN, Johansen M. Vogt RL. 1982. An outbreak of xylene intoxication in a hospital. AMJ Ind Med 3:173-178.

Kyrklund, T, Kjellstrand P, Haglid K. 1987. Brain lipid changes in rats exposed to xylene and toluene. Toxicology 45:123-133.

Litton Bionetics. 1978. Teratology study in rats xylene final report. EPA/OTS Public Files. Submitted by American petroleum Institute. Document No. 878210350.

Marks TA, Ledoux TA, Moore JA > 1982. *Teratogenicity of* a commercial xylene mixture in the mouse. J Toxicol Environ Health 9:97-105.

Mirkova E, Hinkova L, Vassileva L, et al. 1979. Xylene neurotoxicity in pregnant rats and fetuses. Activ Nerv Supp (Praha) 21:265-268.

Morley R, Eccleston DW, Douglas CP, et al. 1970. Xylene poisoning: A report on one fatal case and two cases of recovery after prolonged unconsciousness. Br Med J 3:442-443.

NTP. 1986. NTP technical report on the toxicology and carcinogenesis studies of xylenes (mixed) (60% m-xylene, 14% p-xylene, 9% o-xylene, and 17% ethylbenzene) (CAS no. 1330-20-7) in F344/N rats and B6C3F1 mice (gavage studies). US Department of Health and Human Services,Public Health Service, National Institutes of Health, National Toxicology Program. NTP TR327, NIH Publication No. 87-2583.

Nersesian W, Booth H, Hoxie D, et al. 1985. Illness in office attributed to xylene (Letter). Occup Health Saf 54:88.

Rank J. 1985. Xylene induced feeding and drinking behavior and central adrenergic receptor binding. Neurobehav Toxicol Teratol 7:421-426.

Shigeta S, Aikawa H, Misawa T, et al. 1983. Fetotoxicity of inhaled xylene in mice (Abstract). Teratology 28:22A.

Tatrai E, Ungvary G. 1980. Changes induced by o-xylene inhalations in the rat liver. Acta MedAcad Sci Hung 37:211-216.

Toftgard, R, Nilsen, O G, 1982. Effects of xylene and xylene isomers on cytochrome P-450 and in vitro enzymatic activities in rat liver kidney and lung. Toxicology 23:197-212.

Wimolwattanapun S, Ghosh TK, Mookherjee S, et al. 1987. Effect of inhalation of xylene on intracranial self-stimulation behavior in rat. Neuropharmacology 26:1629-1632.

CHLORDANE REFERENCES

Alvarez, W.C., and Hyman S., 1953. Absence of Toxic Manifestations in Workers Exposed to Chlordane. AMA Arch Ind Hyg Occup Med; 8:480:483.

Barnett, R.W., D'Ercole A.J., and Cain J.D., et al., 1979. Organochlorine Pesticide Residues in Human Milk Samples from Women Living in Northwest and Northeast Mississippi, 1973-1975. Pest Monit J; 13:47:51.

Becker, F.F., and Sell, S., 1979. Alpha feto protein Levels and Hepatic Alterations During Chemical Carcinogenesis in C57BL/6N Mice. Cancer Research; 39:3491:3494.

Ditraglia D., Brown , D.P., and Manekata , T., et al., 1981. Mortality Study of Workers Employed at Organochlorine Pesticide Manufacturing Plants. Scand J Work Environ Health; 7:140:146.

U. S. Environmental Protection Agency (U. S. EPA), 1980. Summary of Reported Pesticide Incidents Involving Chlordane. Pesticide Incident Monitoring System Report No.360; Office of Pesticide Programs, Washington, DC.

Fishbein, W.I., White. J.V., and Isaacs, H.F., 1964. Survey of Workers Exposed to Chlordane. Ind Med Surg; 10:726:727.

Harrington, J.M., Baker, E.L., Jr, and Folland, D.S., et al., 1978. Chlordane *Contamination of a Municipal Water System.* Environ Res; 15:155:159.

Hayes, Wayland J., Jr., MD, Ph.D., 1982. Pesticides Studied in Man, Williams and Williams, Baltimore.

Ingle, L. (1952) Chronic oral toxicity of chlordane to rats. Arch. inc. Hyg. occup. Med., 6:357:367.

International Programme on Chemical Safety (IPCS), 1984. Environmental Health Criteria 34, Chlordane, WHO, Geneva.

Kutz, F.W., Yobs, A.R., and Strassman S.C., 1976. Organochlorine Pesticide Residues in Human Adipose Tissue. Bull Soc Pharm Environ Pathol; 4:17:19.

Kutz, F.W., Strassman, S.C., and Sperling, J.F., 1979. Survey of Selected Organochlorine Pesticides in the General Population of the United States. Annals of the New York Academy of Sciences; 320:60:68.

MacMahon, B., Monson, R.R., and Wang, H.H., et al., 1988. A Second Follow-up of Mortality in a Cohort of Pesticide Applicators. J Occup Med; 30:429:432.

National Cancer Institute (NCI), 1977. Bioassay of Chlordane for Possible Carcinogenicity. Technical Report Series No. 8. U.S. Dept. of Health, Education and Welfare; NIH PB 271 977.

National Institute for Occupational Safety and Health (NIOSH), 1984. Health Hazard Evaluation Report; HETA 83:424:1403. Ozark National Scenic Riverways, Van Buren, MO., Cincinnati, OH.

Princi, F., and Spurbeck, G.H., 1951. A Study of Workers Exposed to the Insecticides Chlordane, Aldrin, Dieldrin. Ind Hyg Occup Med; 3:64:72.

Saito, I., Kawamura N., and Uno K., et al., 1986. Relationship between chlordane and its metabolites in blood of pest control operators and spraying conditions. Int Arch Occup Environ Health; 58:91:97.

Shindell, S., and Ulrich, S., 1986. Mortality of workers employed in the manufacture of chlordane: An update. J Occup Med; 28:497:501.

Stohlman, E.F., Thorp, W.T.S., and Smith, M.I., 1950. Toxic action of chlordane. Arch Ind Hyg Occ Med; 1:13.

Strassman, S.C., and Kutz, F.W., 1977. Insecticide residues in human milk from Arkansas and Mississippi, 1973:74. Pestic Monit J; 10:130:133.

Taguchi, S., and Yakushiji, T., 1988. Influence of termite treatment in the home on the chlordane concentration in human milk. Arch Environ Contam Toxicol; 17:65:72.

Takamiya, K., 1987. Residual levels of plasma oxychlordane and transnonachlor in pest control operators and some characteristics of these accumulations. Bull Environ contam Toxicol; 39: 750:755.

Velsicol Chemical Co. 1983. Thirty month chronic toxicity and tumorigenicity test in rats by chlordane technical. Unpublished study by Research Institute for Animal Science in Biochemistry and Toxicology (RIASBT), Japan. (Cited in EPA 1985a, b, c; EPA 1988c).

Wang, H.H., and MacMahon, B., 1979. Mortality of workers employed in the manufacture of chlordane and heptachlor. J Occup Med; 21:745:748.

p,p' DDT REFERENCES

ASTDR, 1989. Toxicological Profile for p,pl DDT, p,pl DDE and p,pl DDD. Atlanta, GA: ASTDR.

Agthe C, Garcia H, Shubic P, et al., 1970. Study of the potential carcinogenicity of DDT in the Syrian golden hamster (347-40). Proc Soc Exp Biol Med 134:113-116.

Cabral J, Hall R, Rossi L, et al., 1982. Lack of carcinogenicity of DDT in hamsters. Tumori 68:5-10.

Clark J. 1974. Mutagenicity of DDT in mice, Drosophila melanogaster and Neurospora crassa. Aust J. Biol Sci 27:427-40.

De Waziers I, Azais V. 1987. Drug-metabolizing enzyme activities in the liver and intestine of rats exposed to DDT: effects of Vitamin A status. Arch Environ Contam Toxicol 16:343-348.

Deichman W, MacDonald W, Beasley A, et al., 1971. Subnormal reproduction in beagle dogs induced by DDT and aldrin. Ind Med 40:10-20.

EPA, 1988. Integrated Risk Information System (IRIS). Environmental Criteria and Assessment Office, Cincinnati, Ohio.

Garcia M, Mourelle M. 1984. Gamma-glutamyl transpeptidase: A sensitive marker in DDT and toxaphene exposure. J Appl Toxicol 4: 246-248.

Krause W, Hamm K, Weissmuller J. 1975. The effect of DDT on spermatogenesis of the juvenile rat. Bull Environ Contam Toxicol 14:171-179.

NCI. 1978. Bioassays of DDT, TDE, and p,pl - DDE for possible carcinogenicity. National Cancer Institute. CAS No. 50-29-3, 72-54-8, 72-55-9 NCI-CG-TR-131.

HEPTACHLOR REFERENCES

Ahmed FE, Hart RW, Lewis NJ. 1977. Pesticide induced DNA damage and its repair in cultured human cells. Mutat. Res. 42:161-174.

Akay MT, Alp U. 1981. The effects of BHC and heptachlor on mice. Haceteppe Bull. Nat. Sci. Eng. 10:11-22.

ASTDR, 1987. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Heptachlor/Heptachloric Epoxide. Atlanta, GA: ASTDR.

CAG. 1986. Carcinogen Assessment Group. Carcinogenicity assessment of chlordane and heptachlor/heptachlor epoxide. Washington, DC: Office of Health and Environmental Assessment, U.S. Environmental Protection Agency.

Cerey K, and Ruttkay-Nedecka J. 1971. The influence of heptachlor on rat fertility and growth. Z. Versuchstierkd. 13:243-244.

Enan EE, El-Sebae AH, Enan OH. 1982. Effects of liver functions by some chlorinated hydrocarbon insecticides in white rats. Meded. Fac. Landbouwet., Ruklsikov. Gent. 47 (1):447-457.

Epstein SS, Arnold E, Andrea J, Bass W, and Bishop Y. 1972. Detection of chemical mutagens by the dominant lethal assay in the mouse. Toxicol. Appl. Pharmacol. 23:288-325.

Gentile JM, Gentile GJ, Bultman J, Sechriest R, Wagner ED, Plewa MJ. 1982. An evaluation of the genotoxic properties of insecticides following plant and animal activation. Mutat. Res. 101:19-29.

Kurata M, Hirose K, Umeda M. 1982 Inhibition of metabolic cooperation in Chinese hamster cells by organochlorine pesticides. Gann 73:217-221.

NTP. 1987. National Toxicology Program. Unpublished Results from B. Tainer, Toxicology Research Testing Programs, Cellular Genetic Toxicology Branch, NTP, to J. Rowland, Dynamac Corporation; April 15.

Podowski AA, Banerjee BC, Feroz M, Dudek MA, Willey RL, Khan MAQ. 1979. Photolysis of heptachlor and cis-chlordane and toxicity of their photoisomers to animals. Arch. Environ. Contam. Tosicol. 8:509-518.

Telang S, Ton C, Williams GM. 1982. Epigenetic membrane effects of a possible tumor promoting type on cultured liver cells by the non-genotoxic organochlorine pesticide chlordane and heptachlor. Carcinogenesis 310):1175-1178.

Wang HH, MacMahon B. 1979a. Mortality of pesticide applicators. J. Occup. Med 21(11):741-744.

Wang HH, MacMahon B. 1979b. Mortality of workers employed in the manufacture of chlordane and heptachlor. J. Occup. Med. 21(11):745-748.

WHO. 1984. World Health Organization. Environmental Health Criteria 38. Heptachlor. Geneva, Switzerland: WHO.

HEPTACHLOR EPOXIDE

See Heptachlor

POLYCHLORINATED DIBENZO DIOXINS AND FURANS REFERENCES

Axelson, O., L. Sundell, K. Anderson, C. Edling, C. Hogstedt, and H. Kling. 1980. Herbicide Exposureand Tumor Mortality: An Updated Epidemiologic Investigation on Swedish Railroad Workers. Sand. J. Work Environ. Health. 6:73-79.

Berry, D.L., T.J. Slaga, J. DiGiovanni and M.R. Juchau, 1978. Studies with Chlorinated Dibenzo-*p*-dioxins,Polybrominated Biphenyls, and Polychlorinated Biphenyls in a Two-Stage System of Mouse Skin Tumorigenesis: Potent Anti-Carcinogenic Effects. Ann. NY Acad. Sci. 320:405-415.

Brinkman, U.A., and A. DeKok. 1980. Production, Properties, and Usage. In:"Halogenated Biphenyls,Terphenyls, Naphthalenes, Dibenzodioxins and Related Products," R.D. Kimbrough, Ed. Elsevier/North-Holland Biomedical Press, Oxford. Chap. 1.

CDHS. 1985. Report to Scientific Review Panel on Chlorinated Dioxins and Dibenzofurans. Department of Health Services, Sacramento, CAlifornia.

Coggon, D. and E.D. Acheson. 1982. Do Phenoxy Herbicides Cause Cancer in Man? Lancet 1:1057-1059.

Cook, R.R., J.C. Townsend, M.G. Ott, and L.G. Silverstein. 1980. Mortality Experience of Employees Exposed to 2,3,7,8-Tetrachlordibenzo-*p*-dioxin (TCDD). J. Occup. Med. 22(8):530-532.

Hardell, L. and M. Eriksson. 1981. Soft-tissue Sarcomas, Phenoxy Herbicides and Chlorinated Phenols. Lancet 2:250.

Hardell, L. and A. Sandstrom, 1979. Case-Control Study: Soft-tissue Sarcomas andExposure to Phenoxyacetic Acids or Chlorphenols. Br. J. Cancer 39:711-717

Hart, F.C. 1984. Assessment of Potential Public Health Impacts Associated with Predicted Emissions of Polychlorinated Dibenzo-Dioxins and Polychlorinated Dibenzo-Furans from the Brooklyn Navy Yard Resource Recovery Facility. Prepare by Fred C. Hart Associates, Inc., New York, New YOrk.

Herbert, C.D., M.W. Harris, M.R. Elwell and L.S. Birnbaum. 1990. Relative toxicity and tumor promoting activity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin, 2,3,4,7,8-pentachlorodibenzofuran (PCDF) and 1,2,3,4,7,8-hexachlorodibenzofuran (HCDF) in hairless mice. Toxicol. Appl. Pharmacol. 102:362-377.

IARC. 1977. IARC Monograph on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Fumigants, the Herbicides 2,4-D and 2,4,5-T, Chlorinated Dibenzodioxins and Miscellaneous Industrial Chemicals. Vol. 15.

Kimbrough, R.D., H. Falk, P. Stehr, and G. Fries. 1984. Health Implication of 2,3,7,8-Tetrachlordibenzodioxin (TCDD) Contamination of Residential Soil. J. Toxicol. Environ. Health 14:47-93.

Kocibia, R. J. 1984. Evaluation of the Carcinogenic and Mutagenic Potential of 2,3,7,8-TCDD and Other Chlorinated Dioxins. In:"Banbury Report 18: Biological Mechanisms of Dioxin Action." Cold Spring Harbor Laboratory, Cold Springs, NY. pp.73-84.

Kociba, R.J., D.G. Keyes, J.E. Beyer, R.M. Carreon, and P.J. Gehring. 1979. Long-Term Toxicological Studies of 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD) in Laboratory Animals. Ann. NY Acad. Sci. 320:397-404.

Kociba, R.J., D.G. Keyes, J.E. Beyer, R.M Carreon, C.E. Wade, D.A. Dittenber, R.P Kalnins, L.E.Frauson, C.N. Park, S.D. Barnard, R.A. Hummel, and C.G. Humiston. 1978. Results of a Two-YearChronic Toxicity and Oncogenicity Study of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in rats. Toxicol. Appl. Pharmacol. 46:279-303.

Kouri, R.E., T.H. Rude, R. Joglekar et al. 1978. 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin as Cocarcinogen Causing 3-Methylcholanthrene-initiated Subcutaneous Tumors in Mice genetically "nonresponsive" at Ah Locus. Cancer Res. 38(9):2777-2783.

Ott, M.G., B.B. Holder, and R.D. Olson. 1980. A mortality Analysis of Employees engaged in Manufacture of 2,4,5-Trichlorophenoxyacetic Acid. J. Occup. Med. 22(1):47-50.

Pitot, H.C. T. Goldsworthy, H.a. Campbell, and A. Poland. 1980. Quantitative Evaluation of the Promotion of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in the Rat. Environmental Health Perspect. 5:24'-244.

Poland, A. and A. Kende. 1976. 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin: Environmental Contaminant and Molecular Probe. Fed. Proc. 35(12):2404-2411.

Poland, A. and J. Knutson. 1982. 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin and Related Halogenated Aromatic Hydrocarbons: Examination of the Mechanism of Toxicity. Ann Rev Pharmacol Toxicol 22:517-554.

Pratt, R.M., L.Dencker and V. M Diewwert. 1984. 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin-Induced Cleft Palate in the Mouse: Evidence for alterations in Palatal shelf Fusion. Teratogenesis, Carciong. Mutagen. 4:427-436.

Rappe, C. and M. Nygen.1984a. Chemical Analysis of Human Samples Identification and Quantification of Polychlorinated Dioxins and dibenzofurans. In:"Individual Susceptibility to Genotoxic Agents in the Human Population." F.J.de Serres and R.W. Paro, Eds. Plenum Publishing Co. New York, NY. pp.305-314.

Rappe, C. 1984b. Source and Identification, Especially with Respect to PCDDs and PCDFs Found in theEmission of Incinerators. Presented at the Consultation of Organohalogen Compounds in Human Milk and Related Hazards. Bilthoven, Netherlands.

Rappe, C., S. Marklund, L.O.Kjeller, P.A. Bergqvist, and M. Hansson. 1985. Strategies and Techniques for Sample Collection and Analysis: Experiences from Swedish PCB Accidents. Environ. Health. Perspect. 60:279-292.

Safe, S. 1986. Toxicity of Chlorinated Dioxins and Chlorinated Benzofurans. Ann Rev Pharmacol toxicol 46:315-347.

Smith, A.H., D.O. Fisher, H.J. Giles, and N. Pearce. 1983. The New Zealand Soft-tissue Sarcoma Case-Control Study: Interview Findings Concerning Phenoxyacetic Acid Exposure. Chemosphere 12:565-571.

Thiess, A. M., R. Frentzel-Beyme, and R. Link. 1982. Mortality Study of Persons exposed to Dioxin in a Trichlorophenol-Process Accident that occurred in the BASF AG on November 17, 1953. Am. J. Ind. Med. 3:179-189.

U.S. Environmental Protection Agency. 1984. Health Assessment Document for Polychlorinated Dibenzo-*p*-dioxins. Pt. 1 and 2. Washington, D.C. August.

Vos, J.G. 1977. Immune Suppression as Related to Toxicity. C R C Crit. Rev. Toxicol. 5(1):67-101.

Wipf, H.K., E. Homberger, N. Neimer, U.B. Ranalder, W. Vetter, and J.P Vuilleumier. 1982. TCDD-levels in Soil and Plant Samples from the Seveso Area. In:"Chlorinated Dioxins and Related Compounds: Impact on the Environment," O. Hutziner, R.W.Frei, E. Merian and F. Pocchiari, Eds. Pergamon, Press, New York, NY. Vol. 5, pp.115-126.

Whitlock, J.P. 1987. The regulation of gene expression by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin. Pharmacol. Rev.39:147-161.

Zack, J.A. and R.R Suskind. 1980. the Mortality Experience of Workers Exposed to Tetrachlorodibenzodioxin in a Trichlorophenol Process Accident. J. Occup. Med. 22(1):11-14.

2,4-DINITROPHENOL REFERENCES

Demerec M, Bertani G, Flint J. 1951. A survey of chemicals for mutagenic action on E. coli. Am. Natur. 85:119.

Friedman MA, Staub J. 1976. Inhibition of mouse testicular DNA synthesis by mutagens and carcinogens as a potential simple mammalian assay for mutagenesis. Mutat. Res. 37:67.

Horner WD. 1942. Dinitrophenol and its relation to formation of cataracts. Arch. Ophthalmol. 27:1097.

Mitra AB, Manna GK. 1971. Effect of some phenolic compounds on chromosomes of bone marrow cells of mice. Indian J. Med. Res. 59:1442.

Spencer HC, Rowe VK, Adams EM, Irish DC. 1948. Toxicological studies on laboratory animals of certain alkyl dinitrophenols used in agriculture. J. Ind. Hyg. Toxicol. 30:10.

Swenberg JA, Petzgold GL, Harbach PR. 1976. In vitro DNA damage/alkaline elution assay for predicting carcinogenic potential. Biochem. Biophys. Res. Commun. 72:732.

Tainter ML, Stockton AB, Cutting WC. 1935. Dinitrophenol in the treatment of obesity: final report. J. Am. Med. Assoc. 105:332-337.

USEPA. 1980. U.S. Environmental Protection Agency. Office of Water Regulations and Standards. Ambient water quality criteria for nitrophenols. Washington, DC: U.S. Environmental Protection Agency. EPA 440/5-80-063. PB81-117749.

2,4-DINITROTOLUENE REFERENCES

ATSDR. 1988a. Agency for Toxic Substances and Disease Registry. Toxicological profile for 2,4-dinitrotoluene and 2,6-dinitrotoluene (draft). Atlanta, GA: Agency for Toxic Substances and Disease Registry.

Ellis HV, Hong BC, Lee CC. 1980. Mammalian toxicity of munitions compounds. Summary of toxicity of nitrotoluenes. Progress Report No. 11. USAMBRDC Contract No. DAMD-17-74-C-4073.

Ellis HV, Hagenson JH, Hodgson JR, Minor JL, Hong CB. Midwest Research Institute. 1979. Mammalian toxicity of munition compounds. Phase III. Effects of lifetime exposure. Part I. 2,4-Dinitrotoluene. Kansas City, MO: Midwest Research Institute. U.S. Army Medical Research and Development Command. Contract no. DAMD17-74-C-4073. AD-A077692.

Etnier EL. 1987a. Water quality criteria for 2,4-dinitrotoluene and 2,6-dinitrotoluene. Final report prepared for U.S. Army Medical Research and Development Command. Oak Ridge National Laboratory: Oak Ridge, TN. ORNL-6312.

Lee CC, Hong CB, Ellis HV, Dacre JC, Glennon JP. 1985. Subchronic and chronic toxicity studies of 2,4-dinitrotoluene. Part II. CD rats. J. Am. Coll. Toxicol. 4:243-255.

Lee CC, Ellis HV, Kowalski JJ, et al. 1978. Mammalian toxicity of munitions compounds. Phase II: Effects of multiple doses. Part II: 2,4-dinitrotoluene. Progress report No. 3. Midwest Research Institute, Kansas City, MO. Contract No. DAMD 17-74-C-4073.

McCormick NG, Cornell JH, Kaplan AM. 1978. Identification of biotransformation products from 2,4-dinitrotoluene. Appl. Environ. Microbiol. 35:945-948.

TOLUENE REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR), U.S. Public Health Service. 1989. Toxicological Profile for Toluene.

Anderson HR, Macnair RS, Ramsey JD. 1985. Epidemiology: Deaths from abuse of volatile substances: A national epidemiological study. Br Med J 290:304-307.

Andersson R, Carlsson A, Nordqvist MB, et al. 1983. Urinary excretion of hippuric acid and o-cresol after laboratory exposure of humans to toluene. Int Arch Occup Environ Health 53:101-108.

API. 1981. American Petroleum Institute. Mutagenicity evaluation of toluene in the mouse dominant lethal assay. Litton Bionetics, Inc. Proj. no. 21141-05. Final report.

API. 1985. American Petroleum Institute. Two-generation reproduction/fertility study on a petroleum-derived hydrocarbon (i.e.,) toluene [Volume 1].

Aranyi C, OShea WJ, Sherwood RL, et al. 1985. Effects of toluene inhalation on pulmonary host defenses of mice. Toxicol Lett 25:103-110.

Banfer W. 1961. Studies on the effect of pure toluene on the blood picture of photograture printers and helper workers. Zentral fur Arbeitsmed 11:35-40.

Bauchinger M, Schmid E, Dresp J, et al. 1982. Chromosome change in lymphocytes after occupational exposure to toluene. Mutat Res 102:439-445.

Bruckner JV, Peterson RG. 1981a. Evaluation of toluene and acetone inhalant abuse. I. Pharmacology and pharmacodynamics. Toxicol Appl Pharmacol 61:27-38.

Bruckner JV, Peterson RG. 1981b. Evaluation of toluene and acetone inhalant abuse. II. Model development and toxicology. Toxicol Appl Pharmacol 61:302-312.

Capellini A, Alessio L. 1971. The urinary excretion of hippuric acid in workers exposed to toluene. Med Lavoro 62:196-201.

Carpenter CP, Smyth HF. 1946. Chemical burns of the rabbit cornea. Am J Ophthalmo 129:1363-1372.

Carpenter CP, Geary DL, Myers RC, et al. 1976. Petroleum hydrocarbon toxicity studies. XIII. Animal and human response to vapors of toluene concentrate. Toxicol Appl Pharmacol 36:473-490.

CIIT. 1980. Chemical Industry Institute of Toxicology. A twenty-four month inhalation toxicology study in Fischer-344 rat exposed to atmospheric toluene. Executive Summary and Data Tables. Conducted by Industrial Bio-Test Laboratories, Inc., Decatur, IL, and Experimental Pathology Laboratories, Inc., Raleigh, NC for CIIT, Research Triangle Park,NC. October 15, 1980.

Courtney KD, Andrews JE, Springer J, et al. 1986. A perinatal study of toluene in CD-1 mice. Fundam Appl Toxicol 6:145-154.

Devathasan G, Low D, Teoh PC, et al. 1984. Complications of chornic glue (toluene) abuse in adolescents. Aust NZ J Med 14:39-43.

Goodwin TM. 1988. Toluene abuse and renal tubular acidosis in pregnancy. Obstet Gynecol 71:715-718.

Greenburg L, Mayers MR, Heimann H, et al. 1942. The effects of exposure to toluene in industry. J Am Med Assoc 118:573-578.

Haglund U, Lundberg I, Zech L. 1980. Chromosome aberrations and sister chromatic exchanges in Swedish paint industry workers. Scan J Environ Health 6:291-298.

Hanninen H, Eskelinen L., Husman K, et al. 1976. Behavioral effects of long-term exposure to a mixture of organic solvents. Scand J Work Environ Health 4:240-255.

Hartmann RJ, Gause EM, Mendez V, et al. 1984. Effect of exposure to toluene and ethanol alone or in combination on a match-to-sample discrimination task in the juvenile baboon. Proc West Pharmacol Soc 27:251-253.

Hazleton Laboratories. 1962. Acute eye application - albino rabbits. ESSO Research and Engineering Company. Falls Church VA.

Holmberg PC. 1979. Central nervous system defects in children born to mothers exposed to organic solvents during pregnancy. Lancet 2:177.

Honma T, Miyagawa M, Sato M, et al. 1982. Increase in glutamine content of ratmid brain induced by short-term exposure to toluene and hexane. Ind Health 20:109-115.

Ikeda M, Koizumi A, Kasahara M, et al. 1986. Combined effects of n-hexane and toluene on norepinephrine and dopamine levels in rat brain tissues after long-term exposure. Bull Environ Contam Toxicol 36:510-517.

Iregren A. 1986. Subjective and objective signs of organic solvent toxicity among occupationally exposed workers. Scand J Work Environ Health 12:469-475.

Kimura ET, Ebert DM, Dodge PW. 1971. Acute toxicity and limits of solvent residue for sixteen organic solvents. Toxicol Appl Pharmacol 19:699-704.

Kronevi T, Wahlberg J, Holmberg B. 1979. Histopathology of skin, liver, and kidney after epicutaneous administration of five industrial solvents to guinea pigs. Environ Res 19:56-69.

Kyrklund T, Kjellstrand P, Haglid K. 1987. Brain lipid changes in rats exposed to xylene and toluene. Toxicology 5:123-133.

Lundberg I, Hakansson M. 1985. Normal serum activities of liver enzymes in Swedish paint industry workers with heavy exposure to organic solvents. Br J Ind Med 42:596-600.

Maki-Paakkanen J, Husgafvel-Pursiainen K, Kalliomaki PL, et al. 1980. Toluene-exposed workers and chromosome aberrations. J Toxicol Environ Health 6:775-781.

Moszcynski P, Lisiewicz J. 1984. Occupational exposure to benzene, toluene and xylene and the T lymphocyte functions. Haematologia 17:449-453.

NTP 1989. NTP technical report on the toxicology and carcinogenesis studies of tolune (CAS No. 108-88-3) in F344/N rats and B6C3F1 mice. NIH publications no. 89-2826.

Parmeggiani L, Sassi C. 1954. Occupational risk of toluene: environmental studies and clinic investigations of chrome intoxication. Med Lavoro 45:574-587.

Pryor GT, Dickinson J, Feeney E, et al. 1984a. Hearing loss in rats first exposed to toluene as weanlings or as young adults. Neurobehav Toxicol Teratol 6:111-119.

Pryor GT, Rebert CS, Dickinson J, et al. 1984b. Factors affecting toluene-induced to toxicity in rats. Neurobehav Toxicol Teratol 6:223-238.

Schmid E, Bauchinger M, Hauf R. 1985. Chromosome changes with time inlymphocytes after occupational exposure to toluene. Mutat Res 142:37-39.

Seidenberg JM, Becker RA. 1987. A summary of the results of 55 chemicals screened for developmental toxicity in mice. Teratogen Carcinogen Mutagen 7:17-28.

Seiji K, Inoque O, Nakatsuka H, et al. 1987. No biologically significant changes in liver function after occupational exposure to toluene at over-OEL levels. Ind Health 25:163-168.

Smith KN. 1983. Determination of the reproductive effects in mice of nine selected chemicals. Bioassay Systems Corporation. NIOSH Contract No. 210-81-6011. BSC Project No. 10867.

Smyth HF, Weil CS, West JS, et al. 1969. An exploration of joint toxic action: Twenty-seven industrial chemicals incubated in rats in all possible pairs. Toxicol Appl Pharmacol 14:340-347.

Suleiman SA. 1987. Petroleum hydrocarbon toxicity in vitro: effect of n-alkanes,benzene and toluene on pulmonary alveolar macrophges and lysosomal enzymes of the lung. Arch Toxicol 59:402-407.

Tahti H, Karkkainen S, Pyykko K, et al. 1981. Chronic occupational exposure to toluene. Int Arch Occup Environ Health 48:61-69.

U. S. Environmental Protection Agency (EPA). 1985. Drinking water criteria document for toluene. Washington, D.C.: U.S. Environmental Protection Agency Office of Drinking Water. ECAO-CIN-408.

U.S. Environmental Protection Agency, Integrated Risk Information System (IRIS). 1989. Toluene.

U.S. Environmental Protection Agency, Health Effects Assessment Summary Tables (HEAST). 1989. Toluene.

Ungvary G, Tatrai E, Szeberenyi S, et al. 1982. Effect of toluene exposure on the liver under different experimental conditions. Exp Mol Pathol 36:347-360.

Ungvary G, Tatrai E. 1985. On the embryo toxic effects of benzene and its alkyl derivatives in mice, rats and rabbits. Arch Toxicol (Supplement) 8:425-430.

Ungvary G. 1985. The possible contribution of industrial chemicals (organic solvents) to the incidence of congenital defects caused by teratogenic drugs and consumer goods: An experimental study. In: Marois, M., ed. Prevention of physical and mental congenital defects. Part B: Epidemiology, early detection and therapy, and environmental factors. New York: Alan R. Liss, Inc. pp 295-300.

von Oettingen WF, Neal PA, Donahue DD, et al. 1942. The toxicity and potential dangers of toluene with special reference to its maximal permissible concentration. U.S. Public Health Service Publication Health Bull No. 279:50.

Wen CP, Tsai SP, Weiss NS, et al. 1985. Long-term mortality study of oil refinery workers. IV. Exposure to the lubricating-dewaxing process. J Natl Cancer Inst 74:11-18.

Wilson RH. 1943. Toluene poisoning. J Am Med Assoc 123:1106-1108.

Winchester RV, Madjar VM. 1986. Solvent effects on workers in the paint, adhesive and printing industries. Ann Occup Hyg 30:307-317.

Withey RJ, Hall JW. 1975. The joint toxic action of perchloroethylene with benzene or toluene in rats. Toxicology 4:5-15.

Wolf MA, Rowe VK, McCollister DD, et al. 1956. Toxicological studies of certain alkylated benzenes and benzene. AMA ARch Ind Health 14:387-398.

HMX REFERENCES

Everett DJ, Johnson IR, Hudson P, Jones M. Inveresk Research International, Ltd. 1985. HMX: 13 week toxicity study in rats by dietary administration. Final report. Musselburgh, Scotland: Inveresk Research International. Contract no. DAMD17-80-C0053. AD A171601.

Greenough RJ, McDonald P. Inveresk Research International, Ltd. 1985. HMX: 14 day toxicity in mice by dietary administration. Final report. Musselburgh, Scotland: Inveresk Research International. Contract no. DAMD17-80-C-0053. AD A171596.
Hart ER. 1977. Two-year feeding study in rats. Kensington, MD: Litton Bionetics, Inc. Office of Naval Research Contract no. N00014-73-C-0162. AD A040161.

McLellan W, Hartley WR, Brower M. 1988a. Health advisory for octahydro-1,3,5,7-tetranitro-1,3,5-triazine. U.S. Environmental Protection Agency, Washington, DC: Office of Drinking Water.

Simmon VF, Spanggord RJ, Eckford S, McClurg V. 1977. Mutagenicity of some munition wastewater chemicals and chronic test kit reagents. Report to U.S. Army Medical Research and Development Command, Contract No. DAMD 17-76-C-6013.

Stilwell TM, Eischen MA, Margard WL, Matthews MC, Standford TB. 1977. Toxicology investigations of pilot treatment plant wastewaters at Holston Army ammunition plant. Report to U.S. Army Medical Research and Development Command contract no. DAMD 17-74-C-4123. ADA042601.

USEPA. 1988b. U.S. Environmental Protection Agency. Office of Drinking Water. Health advisory for octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX). Washington, DC: U.S. Environmental Protection Agency.

Whong WZ, Speciner ND, Edwards GS. 1980. Mutagenic activity of tetryl, a nitroaromatic explosive, in three microbial test systems. Toxicol. Lett. 5:11-17.

RDX REFERENCES

Cholakis JM, Wong LCK, Van Goethem DL, et al. Midwest Research Institute. 1980. Mammalian toxicological evaluation of RDX. Kansas City, MO: Midwest Research Institute, U.S. Army Medical Research and Development Command, Contract no. DAMD17-78-C-8027. AD A092531.

Ellis HV, Hong BC, Lee CC. 1980. Mammalian toxicity of munitions compounds. Summary of toxicity of nitrotoluenes. Progress Report No. 11. USAMBRDC Contract No. DAMD-17-74-C-4073.

Etnier EL. 1987b. Water quality criteria for hexahydro-1,3,5-trinitro- 1,3,5-triazine (RDX). Final report prepared for U.S. Army Medical Research and Development Command. Oak Ridge National Laboratory: Oak Ridge, TN. ORNL-6178.

Etnier EL. 1986. Water quality criteria for hexahydro-1,3,5-trinitro- 1,3,5-triazine (RDX). Final report prepared for U.S. Army Medical Research and Development Command. Oak Ridge National Laboratory: Oak Ridge, TN. ORNL-6178.

Levine BS, Furedi EM, Gordon DE, Barkley JJ, Lish PM. 1990. Toxic interactions of the munitions compounds TNT and RDX in F344 rats. Fund. Appl. Toxicol. 15:373-380.

Levine BS, Furedi EM, Rac VS, Gordon DE, Lish PM. 1983a. Determination of the chronic mammalian toxicological effects of RDX: Twenty-four month chronic toxicity/carcinogenicity study of hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) in the Fischer 344 rat. Phase V. Vol. 1. Chicago, IL: ITT Research Institute. U.S. Army Medical Research and Development Command contract no. DAMD17-79-C-9161. AD A160774.

Levine BS, Furedi EM, Gordon DE, Burns JM, Lish PM. 1981. Thirteen-week oral (diet) study of trinitrotoluene (TNT), hexahydro-1,3,5-trinitro-1,3,5- triazine (RDX) and TNT/RDX mixtures in the Fischer 344 rat. Chicago, IL: ITT Research Institute. IITRI project nos. L6116/L6121.

Lish PM, Levine BS, Furedi EM, Sagartz EM, Rac VS. 1984. Determination of the chronic mammalian toxicological effects of RDX: Twenty-four month chronic toxicity/carcinogenicity study of hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) in the B6C3F_1 hybrid mouse. Phase VI. Vol. 1. Chicago, IL: IIT Research Institute. U.S. Army Medical Research and Development Command contract no. DAMD17-C-9161. AD A160774.

Martin DP, Hart ER. 1974. Subacute toxicity of RDX and TNT in monkeys. Kensington, MD: Litton Bionetics, Inc. Office of Naval Research contract no. N00014-73-C-0162; NR108-985. AD A044650.

McLellan W, Hartley WR, Brower M. 1988b. Health advisory for hexahydro-1,3,5-trinitro-1,3,5-triazine. U.S. Environmental Protection Agency, Washington, DC: Office of Drinking Water.

Schneider NR, Bradley SL, Anderson ME. 1978. The distribution and metabolism of cyclotrimethylenetrinitramine (RDX) in the rat after subchronic administration. Toxicol. Appl. Pharmacol. 46:163-171.

Schneider NR, Bradley SL, Anderson ME. 1977. Toxicology of cyclotrimethylenetrinitramine: distribution and metabolism in the rat and the miniature swine. Toxicol. Appl. Pharmacol. 39:531-541.

USEPA. 1990b. U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS). Data retrieval on Sierra contaminants of potential concern. August 1, 1990.

USEPA. 1988a. U.S. Environmental Protection Agency. Office of Drinking Water. Health advisory for hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX). Washington, DC: U.S. Environmental Protection Agency.

TETRYL REFERENCES

McGregor DB, Riach CG, Hastwell RM, Dacre JC. 1980. Genotoxic activity of microorganisms of tetryl, 1,3-dinitrobenzene and 1,3,5-trinitrobenzene. Environ. Mutagen. 2(4):531.

Whong WZ, Speciner ND, Edwards GS. 1980. Mutagenic activity of tetryl, a nitroaromatic explosive, in three microbial test systems. Toxicol. Lett. 5:11-17.

1,3,5-TRINITROBENZENE REFERENCES

Cody TE, Witherup S, Hastings L, Stemmer K, Chustion RT. 1981. 1-3-dinitrobenzene: toxic effect in vivo. J. Toxicol. Environ. Health 7:829-847.

Korolev AA, Vo'itesekhovskaia T, Bogdanov MV, Arsen'eva MV, Azkharova TA. 1977. Experimental data on the hygenic standardization of dinitroluene and trintrobenzol in the water reservoirs. Gig. Sanit. 10:17-20. (Russ.)

Senczuk W, Jodynis J, Rogal H. 1976. Effect of the chemical structure of some aromatic compounds on their methemoglobin-inducing properties - aromatic nitro compounds. Bromat. Chem. Toksykol. 9(3):289-294. (Russ.) (Taken from NIOSH Abstr. 00107007).

Slaga TJ, Triplett LL, Smith LH, Witshi HP. 1985. Carcinogenesis of nitrated toluenes and benzenes, skin and lung tumor assays in mice. Final Report. Govt. Reports Announcements and Index. 19:DE85012081. 33 p.

USEPA. 1989e. U.S. Environmental Protection Agency. Office of Health and Environmental Assessment. Health and environmental effects document for 1,3,5-trinitrobenzene. Cincinnati, OH: U.S. Environmental Protection Agency. ECAO-CIN-G071.

Watanabe T, Ishihara N, Ikeda M. 1976. Toxicity of and biological monitoring for 1,3-diamino-2,4,6-trinitrobenzene and other nitro-amino derivatives of benzene and chlorobenzene. Int. Arch. Occup. Environ. Health. 37:157-168.

2,4,6-TRINITROTOLUENE REFERENCES

Dilley JV, Tyson CA, Newell GW. 1979. Mammalian toxicological evaluation of TNT wastewaters. Volume II. Acute and subacute mammalian toxicity of TNT and LAP wastewaters. Final Report prepared for U.S. Army Medical Research and Development Command. Menlo Park, CA: SRI International. Contract no. DAMD17-76-C-6050. AD-A081590.

Dilley JV, Tyson CA, Newell GW. 1978. Mammalian toxicological evaluation of TNT wastewaters. Volume II. Acute and subacute mammalian toxicity of TNT and the LAP mixture. Final Report. Menlo Park, CA: SRI International. DAMD17-76-C-6050. AD-A080 957.

Enzinger RM. 1971. Special study of the effect of a-TNT on microbiological systems and the determination of the biodegradability of a-TNT. U.S. Army Environmental Health Agency, Aberdeen Proving Ground, MD. AD-738497.

Furedi EM, Levine BS, Gordon DE, Rac VS, Lish PM. 1984a. Determination of the chronic mammalian toxicological effects of TNT (Twenty-four month chronic toxicity/carcinogenicity study of trinitroltoluene (TNT) in the Fischer 344 rat). Final Report - Phase III, Volumes 1 to 2. Chicago, IL: IIT Research Institute. Project No. L6116-Study No. 9. DAMD17-79-C-9120. AD-A168637.

Furedi EM, Levine BS, Sagartz JW, Rac VS, Lish PM. 1984b. Determination of the chronic mammalian toxicological effects of TNT (Twenty-four month chronic toxicity/carcinogenicity study of trinitroltoluene (TNT) in the B6C3F1 hybrid mouse). Final Report - Phase IV, Volumes 1 to 3. Chicago, IL: IIT Research Institute. Project No. L6116-Study No. 11. DAMD17-79-C-9120. AD-A168 754.

Levine BS, Furedi EM, Gordon DE, Lish PM, Barkely JJ. 1984. Subchronic toxicity of trinitrotoluene in Fischer 344 rats. Toxicology 32:253-265.

Levine BS, Rust JH, Burns JM, Lish PM. 1983b. Determination of the chronic mammalian toxicological effects of TNT. Twenty-six week subchronic oral toxicity study of trinitrotoluene (TNT) in the beagle dog. Phase II. Final Report. Chicago, IL: ITT Research Institute. Report no. L6116, study no. 5. DAMD 17-79-C-9120. AD-A157 082.

Levine BS, Rust JH, Burns JM, Lish PM. 1983c. Twenty-six week subchronic oral toxicity study of TNT in the beagle dog. Final report. Phase III. Chicago, IL: ITT Research Institute. U.S. Army Medical Research and Development Command contract no. DAMD17-79-C-9120. AD-A157082.

NIOSH. 1988. National Library of Medicine. Registry of toxic effects of chemical substances (RTECS) database. Bethesda, MD: National Library of Medicine, Specialized Information Services.

USEPA. 1989f. U.S. Environmental Protection Agency. Office of Drinking Water. Trinitrotoluene health advisory. Washingtin, DC: U.S. Environmental Protection Agency.

Won WD, Heckly RJ, Glover DJ, Hoffsommer JC. 1974. Metabolic disposition of 2,4,6-trinitrotoluene. Appl. Microbiol. 27:513-516.

Zakhari S, Villaume JE. 1978. A literature review. Problem definition studies on selected toxic chemicals. Vol. 3. Occupational health and safety aspects of 2,4,6-trinitrotoluene (TNT). Philadelphia, PA: The Franklin Institute Research Laboratories. AD A0-55683.

Appendix Q4

Risk Characterization

JMM James M. Montgomery
Consulting Engineers Inc.

Risk Calculations

The following spreadsheets provide the necessary data and physical-chemical information to calculate the cancer risk and the hazard index for all of the exposure scenarios at SAID. The calculations are based on the maximum detected value for ALF, CCB, DRMO and TNT Vehicle Maintenance Subsite and on the average and 95th percentile upper bound (RME)value for the TNT Leaching Beds Subsite. For the casual visitor and worker exposure scenarios, the exposure dose is multiplied by a factor 0.28 (20/70 years) to calculate the 70 year adjusted cancer risk level. For the future residential scenario, the exposure dose is multiplied by a factor 0.42 (30/70 years) to calculate the adjusted cancer risk level.

Table Q4-1

Calculated Risk Estimates For Future Resident Scenario - ALF Groundwater

	GROUNDWATER INGESTION RISKS - ADULT												
	ABONDONED LANDFILL (ALF)												
Chemical	**Conc (ug/l)**	**IR (l/day)**	**BW (kg)**	**Years**	**Dose (mg/kg/day)**	**CPF (mg/kg/day-1)**	**RfD (mg/kg/day)**	**Cancer Risk**	**Hazard Index**				
		2	70	30									
TCE	70.5	2	70	30	2.0E-03	0.011	0	9E-06	0E+00				
Cyanide	3.3	2	70	30	9.4E-05	0	0.02	0E+00	5E-03				
							TOTAL:	9E-06	5E-03				
	SHOWER INHALATION EXPOSURE MODEL												
Chemical	**V (L/min)**	**W (kg)**	**Dt (min)**	**Re (min^-1)**	**S (ug/m^3-min)**	**Ds (min)**	**Cwd (ug/l)**	**FR (l/min)**	**SV (m^3)**	**Cwo (ug/l)**	**Kal (cm/hr)**	**ts (sec)**	**d (mm)**
TCE	10	70	20	0.0083	110.78	15	2.8E+01	22.5	5.66	71	15.09	2	1
	GROUNDWATER INGESTION RISKS - CHILD												
	ABONDONED LANDFILL (ALF)												
Chemical	**Conc (ug/l)**	**IR Age 0-5 (l/day)**	**IR Age 6-17 (l/day)**	**BW Age 0-5 (kg)**	**BW Age 6-17 (kg)**	**Residence Age 0-5**	**Residence Age 6-17**	**Dose Age 0-5 (mg/kg/day)**	**Dose Age 6-17 (mg/kg/day)**	**CPF (mg/kg/day-1)**	**RfD (mg/kg/day)**	**Cancer Risk**	**Hazard Index**
TCE	70.5	0.8	1.1	15	45	6	12	3.8E-03	1.7E-03	0.011	0	7E-06	0E+00
Cyanide	3.3	0.8	1.1	15	45	6	12	1.8E-04	8.1E-05	0	0.02	0E+00	6E-03
											TOTAL:	7E-06	6E-03
	SHOWER INHALATION EXPOSURE MODEL												
Chemical	**V Age 0-5 (L/min)**	**V Age 6-17 (L/min)**	**W Age 0-5 (kg)**	**W Age 6-17 (kg)**	**Dt (min)**	**Re (min^-1)**	**S (ug/m^3-min)**	**Ds (min)**	**Cwd (ug/l)**	**FR (l/min)**	**SV (m^3)**	**Cwo (ug/l)**	**Kal (cm/hr)**

TCE	14	18	15	45	20	0.0083	110.78	15	2.8E+01	22.5	5.66	7.1E+01	15.09

Kl (dless)	T1 (degK)	Ts (degK)	u1 (cp)	us (cp)	k1(VOC) (cm/hr)	R (m3-atm/ mol-K)	T (deg K)	H (m3-atm/ mol)	kg(VOC) (cm/hr)	Kl(CO2) (cm/hr)	Kg(H2O) (cm/hr)	MW (g/mol)	Dose (mg/kg/shr)	Inhal CPF	Inhal RfD
11.43	293	316	1.002	0.6178	11.57	8.21E-05	293	0.021	1110	20	3000	131.5	2.80E-03	1.7E-02	
															TOTAL
ts (sec)	d (mm)	Kl (dless)	T1 (degK)	Ts (degK)	u1 (cp)	us (cp)	k1(VOC) (cm/hr)	R (m3-atm/ mol-K)	T (deg K)	H (m3-atm/ mol)	kg(VOC) (cm/hr)	Kl(CO2) (cm/hr)	Kg(H2O) (cm/hr)	MW (g/mol)	Residence Age 0-5

2	1	11.43	293	316	1.002	0.6178	11 57	8.21E-05	293	0 021	1110	20	3000	131.5	6

Cancer Risk	Hazard Index	Total Cancer Risk	Total Hazard Index					
2.0E-05	0.0E+00	3.0E-05	0.0E+00					
2E-05	0E+00							
TOTAL CANCER RISK			3E-05					
TOTAL HAZARD INDEX			5E-03					
Residence Age 6-17	Dose Age 0-5 (mg/kg/shr)	Dose Age 6-17 (mg/kg/shr)	Inhal CPF	Inhal RfD	Cancer Risk	Hazard Index	Total Cancer Risk	Total Hazard Index

12	1.83E-02	7.85E-03	1.7E-02		5E-05	0E+00	5.6E-05	0.0E+00
				TOTAL	**5E-05**	**0E+00**		
					TOTAL CANCER RISK			6E-05
					TOTAL HAZARD INDEX			6E-03

Table Q4-2

Calculated Risk Estimates For Future Resident Scenario - CCB Groundwater

	GROUNDWATER INGESTION RISKS - ADULT										
	CHEMICAL BURIAL SITE										
Chemical	Conc (ug/l)	IR (l/day)	BW (kg)	Years	Dose (mg/kg/day)	CPF (mg/kg/day-1)	RfD (mg/kg/day)	Cancer Risk	Hazard Index		
		2	70	30							
TCE	6 76	2	70	30	1 9E-04	0 011	0	9E-07	0E+00		
Arsenic	7 25	2	70	30	2 1E-04	1 8	0.001	2E-04	2E-01		
Mercury	0.488	2	70	30	1.4E-05	0	0.0003	0E+00	5E-02		
Selenium	10 6	2	70	30	3 0E-04	0	0.003	0E+00	1E-01		
							TOTAL:	2E-04	4E-01		
	SHOWER INHALATION EXPOSURE MODEL										
Chemical	V (L/min)	W (kg)	Dt (min)	Re (min^-1)	S (ug/m^3-min)	Ds (min)	Cwd (ug/l)	FR (l/min)	SV (m^3)	Cwo (ug/l)	Kal (cm/hr)
TCE	10	70	20	0.0083	10.62	15	2.7E+00	22 5	5.66	6 8E+00	15 09
	GROUNDWATER INGESTION RISKS - CHILD										
Chemical	Conc (ug/l)	IR Age 0-5 (l/day)	IR Age 6-17	BW Age 0-5 (kg)	BW Age 6-17 (kg)	Residence Age 0-5	Residence Age 6-17	Dose Age 0-5 (mg/kg/day)	Dose Age 6-17 (mg/kg/day)	CPF (mg/kg/day-1)	RfD (mg/kg/day)
TCE	6 76	0 8	1 1	15	45	6	12	3 6E-04	1 7E-04	0 011	0
Arsenic	7 25	0 8	1.1	15	45	6	12	3.9E-04	1 8E-04	1 8	0.001
Mercury	0 488	0 8	1 1	15	45	6	12	2.6E-05	1.2E-05	0	0.0003
Selenium	10 6	0 8	1.1	15	45	6	12	5.7E-04	2.6E-04	0	0.003
											TOTAL:
	SHOWER INHALATION EXPOSURE MODEL										
Chemical	V Age 0-5 (L/min)	V Age 6-17 (L/min)	W Age 0-5 (kg)	W Age 6-17 (kg)	Dt (min)	Re (min^-1)	S Shallow Aq (ug/m^3-min)	Ds (min)	Cwd (ug/l)	FR (l/min)	SV (m^3)

TCE	14	18	15	45	20	0.0083	10 62	15	2.7E+00	22.5	5 66

Chemical
TCE
Arsenic
Mercury
Selenium

Chemical	ts (sec)	d (mm)	Kl (dless)	T1 (degK)	Ts (degK)	u1 (cp)	us (cp)	k1(VOC) (cm/hr)	R (m3-atm/ mol-K)	T (deg K)	H (m3-atm/ mol)	kg(VOC) (cm/hr)	Kl(CO2) (cm/hr)	Kg(H2O) (cm/hr)	MW (g/mol)
TCE	2	1	11.43	293	316	1 002	0 6178	11.57	8 21E-05	293	0 021	1110	20	3000	131 5

Chemical	Cancer Risk	Hazard Index
TCE	7E-07	0E+00
Arsenic	1E-04	2E-01
Mercury	0E+00	6E-02
Selenium	0E+00	1E-01
	1E-04	4E-01

Chemical	Cwo (ug/l)	Kel (cm/hr)	ts (sec)	d (mm)	Kl (dless)	T1 (degK)	Ts (degK)	u1 (cp)	us (cp)	k1(VOC) (cm/hr)	R (m3-atm/ mol-K)	T (deg K)	H (m3-atm/ mol)	kg(VOC) (cm/hr)	Kl(CO2) (cm/hr)

TCE	6.76	15.09	2	1	11.43	293	316	1 002	0 6178	11.57	8 21E 05	293	0 021	1110	20

Chemical										
TCE										
Arsenic										
Mercury										
Selenium										
Chemical	Dose (mg/kg/shr)	Inhal CPF	Inhal RfD	Cancer Risk	Hazard Index					
TCE	2.69E-04	1.7E-02		2E-06	0.0E+00					
			TOTAL	2E-06	0E+00					
	TOTAL CANCER RISK				2E-04					
	TOTAL HAZARD INDEX				4E-01					
Chemical										
TCE										
Arsenic										
Mercury										
Selenium										
Chemical	Kg(H2O) (cm/hr)	MW (g/mol)	Residence Age 0-5	Residence Age 6-17	Dose Age 0-5 (mg/kg/shr)	Dose Age 6-17 (mg/kg/shr)	Inhal CPF	Inhal RfD	Cancer Risk	Hazard Index

TCE	3000	131 5	6	12	1 76E-03	7 52E 04	1 7E-02		5E-06	0E+00
							TOTAL CANCER RISK			1E-04
							TOTAL HAZARD INDEX			4E-01

Table Q4-3

Calculated Risk Estimates For Future Resident Scenario - DRMO Groundwater

GROUNDWATER INGESTION RISKS - ADULT
TNT-LEACHING BEDS

Chemical	Chemical	Conc. (ug/l)	IR (l/day)	BW (kg)	Years	Dose (mg/kg/day)	CPF (mg/kg/day-1)	RfD (mg/kg/day)	Cancer Risk	Hazard Index
			2	70	30					
TCE	TCE	25.7	2	70	30	7.3E-04	0.011	0	3E-06	0E+00
Arsenic	Arsenic	4.8	2	70	30	1.4E-04	1.8	0.001	1E-04	1E-01
Selenium	Selenium	11.7	2	70	30	3.3E-04	0	0.003	0E+00	1E-01
								TOTAL:	1E-04	2E-01

SHOWER INHALATION EXPOSURE MODEL

Chemical	Chemical	V (L/min)	W (kg)	Dt (min)	Ra (min^-1)	S (ug/m^3-min)	Ds (min)	Cwd (ug/l)	FR (l/min)	SV (m^3)	Cwo (ug/l)	Kal (cm/hr)	ts (sec)	d (mm)	Kl (dless)	T1 (degK)	Ts (degK)	u1 (cp)	us (cp)
TCE	TCE	10	70	20	0.008	40.38	15	1.0E+01	22.5	5.66	2.6E+01	15.09	2	1	11.43	293	316	1	0.62

GROUNDWATER INGESTION RISKS - CHILD

Chemical	Chemical	Conc (ug/l)	IR Age 0-5 (l/day)	IR Age 6-17 (l/day)	BW Age 0-5 (kg)	BW Age 6-17 (kg)	Residence Age 0-5	Residence Age 6-17	Dose Age 0-5 (mg/kg/day)	Dose Age 6-17 (mg/kg/day)	CPF (mg/kg/day-1)	RfD (mg/kg/day)	Cancer Risk	Hazard Index
TCE	TCE	25.7	0.8	1.1	15	45	6	12	1.4E-03	6.3E-04	0.011	0	2E-06	0E+00
Arsenic	Arsenic	4.8	0.8	1.1	15	45	6	12	2.6E-04	1.2E-04	1.8	0.001	8E-05	2E-01
Selenium	Selenium	11.7	0.8	1.1	15	45	6	12	6.2E-04	2.9E-04	0	0.003	0E+00	1E-01
												TOTAL:	8E-05	3E-01

SHOWER INHALATION EXPOSURE MODEL

Chemical	Chemical	V Age 0-5 (L/min)	V Age 6-17 (L/min)	W Age 0-5 (kg)	W Age 6-17 (kg)	Dt (min)	Ra (min^-1)	S (ug/m^3-min)	Ds (min)	Cwd (ug/l)	FR (l/min)	SV (m^3)	Cwo (ug/l)	Kal (cm/hr)	ts (sec)	d (mm)	Kl (dless)	T1 (degK)	Ts (degK)
TCE	TCE	14	18	15	45	20	0.0083	40.38	15	1.0E+01	22.5	5.66	25.7	15.09	2	1	11.43	293	316

	1	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
1																			
2																			
3																			
4																			
5																			
6																			
7	Chemica																		
8																			
9																			
10																			
11	TCE																		
12	Arsenic																		
13	Seleniun																		
14																			
15																			
16																			
17																			
18															Total	Total			
19											Inhal	Inhal	Cancer	Hazard	Cancer	Hazard			
20	Chemica	k1(VOC	R	T	H	kg(VOC)	Kl(CO2)	Kg(H2O)	MW	Dose	CPF	RfD	Risk	Index	Risk	Index			
21		(cm/hr)	m3-atm	(deg K)	m3-atm	(cm/hr)	(cm/hr)	(cm/hr)	(g/mol)	mg/kg/shr)									
22			mol-K)		mol)														
23	TCE	11.57	#####	293	0.021	1110	20	3000	131.5	1.02E-03	#####		7.4E-06	0.0E+00	1.1E-05	0.0			
24																			
25												TOTAL:	7E-06	0E+00					
26																			
27											TOTAL CANCER RISK			1E-04					
28											TOTAL HAZARD INDEX			2E-01					
29	Chemica																		
30																			
31																			
32																			
33	TCE																		
34	Arsenic																		
35	Seleniun																		
36																			
37																			
38																			
39																			
40	Chemica	u1	ue	k1(VOC	R	T	H	kg(VOC)	Kl(CO2	Kg(H2O)	MW	Residence	Residence	Dose	Dose	Inhal	Inhal	Cancer	Haz
41		(cp)	(cp)	(cm/hr	m3-atm	(deg K)	m3-atm	(cm/hr)	(cm/hr	(cm/hr)	(g/mol)	Age 0-5	Age 6-17	Age 0-5	Age 6-17	CPF	RfD	Risk	Index
42					mol-K)		mol)							(mg/kg/sh	mg/kg/shr)				
43																			
44	TCE	1.002	0.6178	11.57	#####	293	0.021	1110	20	3000	131.5	6	12	6.67E-03	2.86E-03	1.7E-02		2E-05	0E+00
45																			
46																	TOTAL:	2E-05	0
47																			
48																TOTAL CANCER RISK			1E-04
49																TOTAL HAZARD INDEX			3E-01

	1	38	39
1			
2			
3			
4			
5			
6			
7	Chemica		
8			
9			
10			
11	TCE		
12	Arsenic		
13	Seleniun		
14			
15			
16			
17			
18			
19			
20	Chemica		
21			
22			
23	TCE		
24			
25			
26			
27			
28			
29	Chemica		
30			
31			
32			
33	TCE		
34	Arsenic		
35	Seleniun		
36			
37			
38			
39		Total	Total
40	Chemica	Cancer	Hazard
41		Risk	Index
42			
43			
44	TCE	####	0.0
45			
46			
47			
48			
49			

Table Q4-4

Calculated Risk Estimates For Future Resident Scenario - TNT Maintenance Groundwater RME

GROUNDWATER INGESTION RISKS - ADULT
TNT-VEHICLE MAINTENANCE AREA (TNT-MWA-10)

Chemical	Chemical	Conc (ug/l)	IR (l/day)	BW (kg)	Years	Dose (mg/kg/day)	CPF (mg/kg/day-1)	RfD (mg/kg/day)	Cancer Risk	Hazard Index
			2	70	30					
Benzene	Benzene	5.94	2	70	30	1.7E-04	0.029	0	2E-06	0E+00
CCl4	CCl4	190	2	70	30	5.4E-03	0.13	0.0007	3E-04	8E+00
Chloroform	Chloroform	923	2	70	30	2.6E-02	0.0061	0.01	7E-05	3E+00
1,2-DCA	1,2-DCA	101	2	70	30	2.9E-03	0.091	0	1E-04	0E+00
TCE	TCE	952	2	70	30	2.7E-02	0.011	0	1E-04	0E+00
Arsenic	Arsenic	12	2	70	30	3.4E-04	1.8	0.001	3E-04	3E-01
Chromium	Chromium	227	2	70	30	6.5E-03	0	0.005	0E+00	1E+00
								TOTAL:	9E-04	1E+01

SHOWER INHALATION EXPOSURE MODEL

Chemical	Chemical	V (L/min)	W (kg)	Dt (min)	Ra (min^-1)	S (ug/m^3-min)	Ds (min)	Cwd (ug/l)	FR (l/min)	SV (m^3)	Cwo (ug/l)	Kal (cm/hr)	ts (sec)
Benzene	Benzene	10	70	20	0.0083	11.22	15	2.8E+00	22.5	5.66	5.9E+00	19.34	2
CCL4	CCL4	10	70	20	0.0083	282.52	15	7.1E+01	22.5	5.66	1.9E+02	14.05	2
Chloroform	Chloroform	10	70	20	0.0083	1494.63	15	3.8E+02	22.5	5.66	9.2E+02	15.69	2
1,2-DCA	1,2-DCA	10	70	20	0.0083	166.36	15	4.2E+01	22.5	5.66	1.0E+02	16.05	2
TCE	TCE	10	70	20	0.0083	1495.95	15	3.8E+02	22.5	5.66	9.5E+02	15.09	2

GROUNDWATER INGESTION RISKS - CHILD

Chemical	Chemical	Conc (ug/l)	IR Age 0-5 (l/day)	IR Age 6-17 (l/day)	BW Age 0-5 (kg)	BW Age 6-17 (kg)	Residence Age 0-5	Residence Age 6-17	Dose Age 0-5 (mg/kg/day)	Dose Age 6-17 (mg/kg/day)	CPF (mg/kg/day-1)	RfD (mg/kg/day)	Cancer Risk
Benzene	Benzene	5.94	0.8	1.1	15	45	6	12	3.2E-04	1.5E-04	0.029	0	2E-06
CCl4	CCl4	190	0.8	1.1	15	45	6	12	1.0E-02	4.6E-03	0.13	0.0007	2E-04
Chloroform	Chloroform	923	0.8	1.1	15	45	6	12	4.9E-02	2.3E-02	0.0061	0.01	5E-05
1,2-DCA	1,2-DCA	101	0.8	1.1	15	45	6	12	5.4E-03	2.5E-03	0.091	0	8E-05
TCE	TCE	952	0.8	1.1	15	45	6	12	5.1E-02	2.3E-02	0.011	0	9E-05
Arsenic	Arsenic	12	0.8	1.1	15	45	6	12	6.4E-04	2.9E-04	1.8	0.001	2E-04
Chromium	Chromium	227	0.8	1.1	15	45	6	12	1.2E-02	5.5E-03	0	0.005	0E+00
												TOTAL:	6E-04

SHOWER INHALATION EXPOSURE MODEL

Chemical	Chemical	V	V	W	W	Dt	Re	S	Ds	Cwd	FR	SV	Cwo
		Age 0-5 (L/min)	Age 6-17 (L/min)	Age 0-5 (kg)	Age 6-17 (kg)	(min)	(min^-1)	(ug/m^3-min)	(min)	(ug/l)	(l/min)	(m^3)	(ug/l)
Benzene	Benzene	14	18	15	45	20	0.0083	11.22	15	2.8E+00	22.5	5.66	5.9E+00
CCL4	CCL4	14	18	15	45	20	0.0083	282.52	15	7.1E+01	22.5	5.66	1.9E+02
Chloroform	Chloroform	14	18	15	45	20	0.0083	1494.63	15	3.8E+02	22.5	5.66	9.2E+02
1,2-DCA	1,2-DCA	14	18	15	45	20	0.0083	166.36	15	4.2E+01	22.5	5.66	1.0E+02
TCE	TCE	14	18	15	45	20	0.0083	1495.95	15	3.8E+02	22.5	5.66	9.5E+02

Chemical
Benzene
CCl4
Chloroform
1,2-DCA
TCE
Arsenic
Chromium

Chemical	d (mm)	Kl (dless)	T1 (degK)	Ts (degK)	u1 (cp)	us (cp)	kl(VOC) (cm/hr)	R (m3-atm/mol-K)	T (deg K)	H (m3-atm/mol)	kg(VOC) (cm/hr)	Kl(CO2) (cm/hr)	Kg(H2O) (cm/hr)	MW (g/mol)
Benzene	1	14.65	293	316	1.002	0.6178	15.02	8.21E-05	293	0.01	1441	20	3000	78
CCL4	1	10.65	293	316	1.002	0.6178	10.69	8.21E-05	293	0.063	1026	20	3000	154
Chloroform	1	11.89	293	316	1.002	0.6178	12.16	8.21E-05	293	0.011	1167	20	3000	119
1,2-DCA	1	12.16	293	316	1.002	0.6178	13.33	8.21E-05	293	0.0026	1279	20	3000	99
TCE	1	11.43	293	316	1.002	0.6178	11.57	8.21E-05	293	0.021	1110	20	3000	131.5

Chemical	Hazard Index
Benzene	0E+00
CCl4	9E+00
Chloroform	3E+00
1,2-DCA	0E+00
TCE	0E+00
Arsenic	4E-01
Chromium	2E+00
	1E+01

Chemical	Kel (cm/hr)	ts (sec)	d (mm)	Kl (dless)	T1 (degK)	Ts (degK)	u1 (cp)	us (cp)	k1(VOC) (cm/hr)	R (m3-atm/mol-K)	T (deg K)	H (m3-atm/mol)	kg(VOC) (cm/hr)	Kl(CO2) (cm/hr)
Benzene	19.34	2	1	14.65	293	316	1.002	0.6178	15.02	8.21E-05	293	0.01	1441	20
CCL4	14.05	2	1	10.65	293	316	1.002	0.6178	10.69	8.21E-05	293	0.063	1026	20
Chloroform	15.69	2	1	11.89	293	316	1.002	0.6178	12.16	8.21E-05	293	0.011	1167	20
1,2-DCA	16.05	2	1	12.16	293	316	1.002	0.6178	13.33	8.21E-05	293	0.0026	1279	20
TCE	15.09	2	1	11.43	293	316	1.002	0.6178	11.57	8.21E-05	293	0.021	1110	20

Chemical												
Benzene												
CCl4												
Chloroform												
1,2-DCA												
TCE												
Arsenic												
Chromium												
Chemical	Dose (mg/kg/shr)	Inhal CPF	Inhal RfD	Cancer Risk	Hazard Index	Total Cancer Risk	Total Hazard Index					
Benzene	2.84E-04	2.9E-02	1.4E-03	3.5E-06	2.0E-01	5.6E-06	2.0E-01					
CCL4	7.15E-03	1.3E-01	7.0E-04	4.0E-04	1.0E+01	7.0E-04	1.8E+01					
Chloroform	3.78E-02	8.1E-02	0.01	1.3E-03	3.8E+00	1.4E-03	6.4E+00					
1,2-DCA	4.21E-03	9.1E-02	0.0E+00	1.6E-04	0.0E+00	2.3E-04	2.6E+00					
TCE	3.78E-02	1.7E-02	0.0E+00	2.8E-04	0.0E+00	4.0E-04	0.0E+00					
			TOTAL	2E-03	1E+01							
			TOTAL CANCER RISK				3E-03					
			TOTAL HAZARD INDEX				3E+01					
Chemical												
Benzene												
CCl4												
Chloroform												
1,2-DCA												
TCE												
Arsenic												
Chromium												
											Total	Total

Chemical	Kg(H2O) (cm/hr)	MW (g/mol)	Residence Age 0-5	Residence Age 6-17	Dose Age 0-5 (mg/kg/shr)	Dose Age 6-17 (mg/kg/shr)	Inhal CPF	Inhal RfD	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
Benzene	3000	78	6	12	1.85E-03	7.95E-04	2.9E-02	1.4E-03	9E-06	8E-01	1.0E-05	8.2E-01
CCL4	3000	154	6	12	4.67E-02	2.00E-02	1.3E-01	7.0E-04	1E-03	4E+01	1.2E-03	5.1E+01
Chloroform	3000	119	6	12	2.47E-01	1.06E-01	8.1E-02	1.0E-02	3E-03	2E+01	3.2E-03	1.8E+01
1,2-DCA	3000	99	6	12	2.75E-02	1.18E-02	9.1E-02	0.0E+00	4E-04	0E+00	4.9E-04	0.0E+00
TCE	3000	131.5	6	12	2.47E-01	1.06E-01	1.7E-02	0.0E+00	7E-04	0E+00	8.6E-04	4.1E-01
								TOTAL	5E-03	6E+01		
								TOTAL CANCER RISK				6E-03
								TOTAL HAZARD INDEX				7E+01

	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1										Table Q4-5										
2										Calculated Risk Estimates For Future Resident Scenario - TNT Leaching Beds Groundwater, Average										
3																				
4			GROUNDWATER INGESTION RISKS - ADULT																	
5			AVERAGE SCENARIO																	
6																				
7	Chemica	Chemica	Conc.	IR	BW	Years	Dose	CPF	RfD	Cancer	Hazard									
8			(ug/l)	(l/day)	(kg)		(mg/kg/	(mg/kg/	(mg/kg/	Risk	Index									
9				2	70	30	day)	day-1)	day)											
10																				
11	Arsenic	Arsenic	13	2	70	30	3.7E-04	1.8	0.001	3E-04	4E-01									
12	Chromiu	Chromiu	3.7	2	70	30	1.1E-04	0	0.005	0E+00	2E-02									
13	Mercury	Mercury	0.16	2	70	30	4.6E-06	0	0.0003	0E+00	2E-02									
14	Seleniun	Seleniun	3.7	2	70	30	1.1E-04	0	0.003	0E+00	4E-02									
15	Benzene	Benzene	0	2	70	30	0.0E+00	0.029	0	0E+00	0E+00									
16	Carbon T	Carbon T	2.2	2	70	30	6.3E-05	0.13	0.0007	4E-06	9E-02									
17	Chlorofo	Chlorofo	4.4	2	70	30	1.3E-04	0.0061	0.01	3E-07	1E-02									
18	1,2-DCA	1,2-DCA	0.3	2	70	30	8.6E-06	0.091	0	3E-07	0E+00									
19	TCE	TCE	22	2	70	30	6.3E-04	0.011	0	3E-06	0E+00									
20	2,4-DNP	2,4-DNP	11	2	70	30	3.1E-04	0	0.002	0E+00	2E-01									
21	2,4-DNT	2,4-DNT	3.6	2	70	30	1.0E-04	0.68	0.001	3E-05	1E-01									
22	HMX	HMX	1.8	2	70	30	5.1E-05	0	0.05	0E+00	1E-03									
23	RDX	RDX	48	2	70	30	1.4E-03	0.11	0.002	6E-05	7E-01									
24	Tetryl	Tetryl	0.68	2	70	30	1.9E-05	0	0	0E+00	0E+00									
25	1,3,5-TN	1,3,5-TN	26	2	70	30	7.4E-04	0	0.00005	0E+00	1E+01									
26	2,4,6-TN	2,4,6-TN	1.4	2	70	30	4.0E-05	0.03	0.0005	5E-07	8E-02									
27																				
28									TOTAL:	4E-04	2E+01									
29			SHOWER INHALATION EXPOSURE MODEL																	
30																				
31	Chemica	Chemica	V	W	Dt	Ra	S	Ds	Cwd	FR	SV	Cwo	Kal	ts	d	Kl	T1	Ts	ul	us
32			(L/min)	(kg)	(min)	(min^-1)	(ug/m^3-	(min)	(ug/l)	(l/min)	(m^3)	(ug/l)	(cm/hr)	(sec)	(mm)	(dless)	(degK)	(degK)	(cp)	(cp)
33							min)													
34	Benzene	Benzene	10	70	20	0.0083	0.00	15	0.0E+00	22.5	5.66	0.0E+00	19.34	2	1	14.65	293	316	1	0.62
35	Carbon T	Carbon T	10	70	20	0.0083	3.27	15	8.2E-01	22.5	5.66	2.2E+00	14.05	2	1	10.65	293	316	1	0.62
36	Chlorofo	Chlorofo	10	70	20	0.0083	7.13	15	1.8E+00	22.5	5.66	4.4E+00	15.69	2	1	11.89	293	316	1	0.62
37	1,2-DCA	1,2-DCA	10	70	20	0.0083	0.49	15	1.2E-01	22.5	5.66	3.0E-01	16.05	2	1	12.16	293	316	1	0.62
38	TCE	TCE	10	70	20	0.0083	34.57	15	8.7E+00	22.5	5.66	2.2E+01	15.09	2	1	11.43	293	316	1	0.62
39																				
40																				
41																				
42			GROUNDWATER INGESTION RISKS - CHILD																	
43																				
44	Chemica	Chemical		IR	IR	BW	BW	Residence	Residence	Dose	Dose	CPF	RfD	Canc er	Hazard					
45			Conc	Age 0-5	Age 6-17	Age 0-5	Age 6-17	Age 0-5	Age 6-17	Age 0-5	Age 6-17	(mg/kg/	(mg/kg	Risk	Index					
46			(ug/l)	(l/day)	(l/day)	(kg)	(kg)			(mg/kg/	(mg/kg/	day-1)	/day)							
47										day)	day)									
48	Arsenic	Arsenic	13	0.8	1.1	15	45	6	12	6.9E-04	3.2E-04	1.8	0.001	2E-04	4E-01					
49	Chromiu	Chromiu	3.7	0.8	1.1	15	45	6	12	2.0E-04	9.0E-05	0	0.005	0E+00	3E-02					

	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
50	Mercury	Mercury	0.16	0.8	1.1	15	45	6	12	8.5E-06	3.9E-06	0	0.0003	0E+00	2E-02					
51	Seleniun	Seleniun	3.7	0.8	1.1	15	45	6	12	2.0E-04	9.0E-05	0	0.003	0E+00	4E-02					
52	Benzene	Benzene	0	0.8	1.1	15	45	6	12	0.0E+00	0.0E+00	0.029	0	0E+00	0E+00					
53	Carbon T	Carbon T	2.2	0.8	1.1	15	45	6	12	1.2E-04	5.4E-05	0.13	0.0007	3E-06	1E-01					
54	Chlorofo	Chlorofo	4.4	0.8	1.1	15	45	6	12	2.3E-04	1.1E-04	0.0061	0.01	2E-07	1E-02					
55	1,2-DCA	1,2-DCA	0.3	0.8	1.1	15	45	6	12	1.6E-05	7.3E-06	0.091	0	2E-07	0E+00					
56	TCE	TCE	22	0.8	1.1	15	45	6	12	1.2E-03	5.4E-04	0.011	0	2E-06	0E+00					
57	2,4-DNP	2,4-DNP	11	0.8	1.1	15	45	6	12	5.9E-04	2.7E-04	0	0.002	0E+00	2E-01					
58	2,4-DNT	2,4-DNT	3.6	0.8	1.1	15	45	6	12	1.9E-04	8.8E-05	0.68	0.001	2E-05	1E-01					
59	HMX	HMX	1.8	0.8	1.1	15	45	6	12	9.6E-05	4.4E-05	0	0.05	0E+00	1E-03					
60	RDX	RDX	48	0.8	1.1	15	45	6	12	2.6E-03	1.2E-03	0.11	0.002	5E-05	8E-01					
61	Tetryl	Tetryl	0.68	0.8	1.1	15	45	6	12	3.6E-05	1.7E-05	0	0	0E+00	0E+00					
62	1,3,5-TN	1,3,5-TN	26	0.8	1.1	15	45	6	12	1.4E-03	6.4E-04	0	5E-05	0E+00	2E+01					
63	2,4,6-TN	2,4,6-TN	1.4	0.8	1.1	15	45	6	12	7.5E-05	3.4E-05	0.03	0.0005	4E-07	1E-01					
64																				
65													TOTAL:	3E-04	2E+01					
66			SHOWER INHALATION EXPOSURE MODEL																	
67																				
68	Chemica	Chemica	V	V	W	W	Di	Ra	S	Ds	Cwd	FR	SV	Cwo	Kal	ts	d	Kl	Tl	Ts
69			Age 0-5	Age 6-17	Age 0-5	Age 6-17	(min)	(min^-1)	(ug/m^3-	(min)	(ug/l)	(l/min)	(m^3)	(ug/l)	(cm/hr)	(sec)	(mm)	(dless)	(degK)	(degK
70			(L/min)	(L/min)	(kg)	(kg)			min)											
71																				
72	Benzene	Benzene	14	18	15	45	20	0.0083	0.00	15	0.0E+00	22.5	5.66	0	19.34	2	1	14.65	293	316
73	Carbon T	Carbon T	14	18	15	45	20	0.0083	3.27	15	8.2E-01	22.5	5.66	2.2	14.05	2	1	10.65	293	316
74	Chlorofo	Chlorofo	14	18	15	45	20	0.0083	7.13	15	1.8E+00	22.5	5.66	4.4	15.69	2	1	11.89	293	316
75	1,2-DCA	1,2-DCA	14	18	15	45	20	0.0083	0.49	15	1.2E-01	22.5	5.66	0.3	16.05	2	1	12.16	293	316
76	TCE	TCE	14	18	15	45	20	0.0083	34.57	15	8.7E+00	22.5	5.66	22	15.09	2	1	11.43	293	316
77																				
78																				
79																				
80																				
81																				

	1	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
1																			
2																			
3																			
4																			
5																			
6																			
7	Chemica																		
8																			
9																			
10																			
11	Arsenic																		
12	Chromiu																		
13	Mercury																		
14	Seleniu																		
15	Benzene																		
16	Carbon T																		
17	Chlorofo																		
18	1,2-DCA																		
19	TCE																		
20	2,4-DNP																		
21	2,4-DNT																		
22	HMX																		
23	RDX																		
24	Tetryl																		
25	1,3,5-TN																		
26	2,4,6-TN																		
27																			
28																			
29															Total	Total			
30											Inhal	Inhal	Cancer	Hazard	Cancer	Hazard			
31	Chemica	k1(VOC)	R	T	H	kg(VOC)	Kl(CO2)	Kg(H2O)	MW	Dose	CPF	RfD	Risk	Index	Risk	Index			
32		(cm/hr)	m3-atm	(deg K)	m3-atm	(cm/hr)	(cm/hr)	(cm/hr)	(g/mol	mg/kg/shr)									
33			mol-K)		mol)														
34	Benzene	15.02	#####	293	0.01	1441	20	3000	78	0.00E+00	#####	1.4E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00			
35	Carbon T	10.69	#####	293	0.063	1026	20	3000	154	8.27E-05	#####	7.0E-04	4.6E-06	1.2E-01	8.1E-06	2.1E-01			
36	Chlorofo	12.16	#####	293	0.011	1167	20	3000	119	1.80E-04	#####	0.01	6.3E-06	1.8E-02	6.6E-06	3.1E-02			
37	1,2-DCA	13.33	#####	293	0.0026	1279	20	3000	99	1.25E-05	#####	0.0E+00	4.9E-07	0.0E+00	8.2E-07	0.0E+00			
38	TCE	11.57	#####	293	0.021	1110	20	3000	131.5	8.74E-04	#####	0.0E+00	6.4E-06	0.0E+00	9.3E-06	0.0E+00			
39																			
40												TOTAL:	2E-05	1E-01					
41																			
42											TOTAL CANCER RISK			4E-04					
43											TOTAL HAZARD INDEX			2E+01					
44	Chemica																		
45																			
46																			
47																			
48	Arsenic																		
49	Chromiu																		

	1	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
50	Mercury																		
51	Seleniu																		
52	Benzene																		
53	Carbon T																		
54	Chlorofo																		
55	1,2-DCA																		
56	TCE																		
57	2,4-DNP																		
58	2,4-DNT																		
59	HMX																		
60	RDX																		
61	Tetryl																		
62	1,3,5-TN																		
63	2,4,6-TN																		
64																			
65																			
66																			
67																			
68	Chemica	u1	us	k1(VOC)	R	T	H	kg(VOC)	Kl(CO2)	Kg(H2O)	MW	Residence	Residence	Dose	Dose	Inhal	Inhal	Cancer	Haz
69		(cp)	(cp)	(cm/hr)	m3-atm	(deg K)	m3-atm	(cm/hr)	(cm/hr)	(cm/hr)	(g/mol)	Age 0-5	Age 6-17	Age 0-5	Age 6-17	CPF	RfD	Risk	Index
70					mol-K)		mol)							(mg/kg/	(mg/kg/				
71														shr)	shr)				
72	Benzene	1.002	0.6178	15.02	#####	293	0.01	1441	20	3000	78	6	12	0.00E+00	0.00E+00	2.9E-02	####	0E+00	0E+00
73	Carbon T	1.002	0.6178	10.69	#####	293	0.063	1026	20	3000	154	6	12	5.41E-04	2.32E-04	1.3E-01	####	1E-05	5E-01
74	Chlorofo	1.002	0.6178	12.16	#####	293	0.011	1167	20	3000	119	6	12	1.18E-03	5.05E-04	8.1E-02	####	2E-05	7E-02
75	1,2-DCA	1.002	0.6178	13.33	#####	293	0.0026	1279	20	3000	99	6	12	8.17E-05	3.50E-05	9.1E-02	0E+00	1E-06	0E+00
76	TCE	1.002	0.6178	11.57	#####	293	0.021	1110	20	3000	131.5	6	12	5.71E-03	2.45E-03	1.7E-02	0E+00	2E-05	0E+00
77																			
78																			
79																	TOTAL	4E-05	6E-01
80																TOTAL CANCER RISK			3E-04
81																TOTAL HAZARD INDEX			2E+01

	1	38	39
1			
2			
3			
4			
5			
6			
7	Chemica		
8			
9			
10			
11	Arsenic		
12	Chromiu		
13	Mercury		
14	Seleniun		
15	Benzene		
16	Carbon T		
17	Chlorofo		
18	1,2-DCA		
19	TCE		
20	2,4-DNP		
21	2,4-DNT		
22	HMX		
23	RDX		
24	Tetryl		
25	1,3,5-TN		
26	2,4,6-TN		
27			
28			
29			
30			
31	Chemica		
32			
33			
34	Benzene		
35	Carbon T		
36	Chlorofo		
37	1,2-DCA		
38	TCE		
39			
40			
41			
42			
43			
44	Chemica		
45			
46			
47			
48	Arsenic		
49	Chromiu		

	1	38	39
50	Mercury		
51	Selenium		
52	Benzene		
53	Carbon T		
54	Chlorofo		
55	1,2-DCA		
56	TCE		
57	2,4-DNP		
58	2,4-DNT		
59	HMX		
60	RDX		
61	Tetryl		
62	1,3,5-TN		
63	2,4,6-TN		
64			
65			
66			
67		Total	Total
68	Chemica	Cancer	Hazard
69		Risk	Index
70			
71			
72	Benzene	####	####
73	Carbon T	####	####
74	Chlorofo	####	####
75	1,2-DCA	####	####
76	TCE	####	####
77			
78			
79			
80			
81			

	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1										Table Q4-6										
2										Calculated Risk Estimates For Future Resident Scenario - TNT Leaching Beds Groundwater, RME										
3																				
4			GROUNDWATER INGESTION RISKS - ADULT																	
5			RME SCENARIO																	
6																				
7	Chemica	Chemica	Conc.	IR	BW	Years	Dose	CPF	RfD	Cancer	Hazard									
8			(ug/l)	(l/day)	(kg)		(mg/kg/	(mg/kg/	(mg/kg/	Risk	Index									
9				2	70	30	day)	day-1)	day)											
10																				
11	Arsenic	Arsenic	17	2	70	30	4.9E-04	1.8	0.001	4E-04	5E-01									
12	Chromiu	Chromiu	4.6	2	70	30	1.3E-04	0	0.005	0E+00	3E-02									
13	Mercury	Mercury	0.24	2	70	30	6.9E-06	0	0.0003	0E+00	2E-02									
14	Selenium	Selenium	5.5	2	70	30	1.6E-04	0	0.003	0E+00	5E-02									
15	Benzene	Benzene	0	2	70	30	0.0E+00	0.029	0	0E+00	0E+00									
16	Carbon T	Carbon T	5.6	2	70	30	1.6E-04	0.13	0.0007	9E-06	2E-01									
17	Chlorofo	Chlorofo	12	2	70	30	3.4E-04	0.0061	0.01	9E-07	3E-02									
18	1,2-DCA	1,2-DCA	0.41	2	70	30	1.2E-05	0.091	0	5E-07	0E+00									
19	TCE	TCE	56	2	70	30	1.6E-03	0.011	0	8E-06	0E+00									
20	2,4-DNP	2,4-DNP	12	2	70	30	3.4E-04	0	0.002	0E+00	2E-01									
21	2,4-DNT	2,4-DNT	6.4	2	70	30	1.8E-04	0.68	0.001	5E-05	2E-01									
22	HMX	HMX	3.1	2	70	30	8.9E-05	0	0.05	0E+00	2E-03									
23	RDX	RDX	110	2	70	30	3.1E-03	0.11	0.002	1E-04	2E+00									
24	Tetryl	Tetryl	1.2	2	70	30	3.4E-05	0	0	0E+00	0E+00									
25	1,3,5-TN	1,3,5-TN	67	2	70	30	1.9E-03	0	0.00005	0E+00	4E+01									
26	2,4,6-TN	2,4,6-TN	2.9	2	70	30	8.3E-05	0.03	0.0005	1E-06	2E-01									
27																				
28									TOTAL:	6E-04	4E+01									
29			SHOWER INHALATION EXPOSURE MODEL																	
30																				
31	Chemica	Chemica	V	W	Di	Re	S	Ds	Cwd	FR	SV	Cwo	Kal	ts	d	Kl	T1	Ts	u1	us
32			(L/min)	(kg)	(min)	(min^-1)	(ug/m^3-	(min)	(ug/l)	(l/min)	(m^3)	(ug/l)	(cm/hr)	(sec)	(mm)	(dless)	(degK)	(degK)	(cp)	(cp)
33							min)													
34	Benzene	Benzene	10	70	20	0.0083	0.00	15	0.0E+00	22.5	5.66	0.0E+00	19.34	2	1	14.65	293	316	1	0.62
35	Carbon T	Carbon T	10	70	20	0.0083	8.33	15	2.1E+00	22.5	5.66	5.6E+00	14.05	2	1	10.65	293	316	1	0.62
36	Chlorofo	Chlorofo	10	70	20	0.0083	19.43	15	4.9E+00	22.5	5.66	1.2E+01	15.69	2	1	11.89	293	316	1	0.62
37	1,2-DCA	1,2-DCA	10	70	20	0.0083	0.68	15	1.7E-01	22.5	5.66	4.1E-01	16.05	2	1	12.16	293	316	1	0.62
38	TCE	TCE	10	70	20	0.0083	88.00	15	2.2E+01	22.5	5.66	5.6E+01	15.09	2	1	11.43	293	316	1	0.62
39																				
40																				
41																				
42			GROUNDWATER INGESTION RISKS - CHILD																	
43																				
44	Chemica	Chemical		IR	IR	BW	BW	Residenc	Residenc	Dose	Dose	CPF	RfD	Canc er	Hazard					
45			Conc	Age 0-5	Age 6-17	Age 0-5	Age 6-17	Age 0-5	Age 6-17	Age 0-5	Age 6-17	(mg/kg/	(mg/kg	Risk	Index					
46			(ug/l)	(l/day)	(l/day)	(kg)	(kg)			(mg/kg/	(mg/kg/	day-1)	/day)							
47										day)	day)									
48	Arsenic	Arsenic	17	0.8	1.1	15	45	6	12	9.1E-04	4.2E-04	1.8	0.001	3E-04	6E-01					
49	Chromiu	Chromiu	4.6	0.8	1.1	15	45	6	12	2.5E-04	1.1E-04	0	0.005	0E+00	3E-02					

	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
50	Mercury	Mercury	0.24	0.8	1.1	15	45	6	12	1.3E-05	5.9E-06	0	0.0003	0E+00	3E-02					
51	Seleniu	Seleniu	5.5	0.8	1.1	15	45	6	12	2.9E-04	1.3E-04	0	0.003	0E+00	6E-02					
52	Benzene	Benzene	0	0.8	1.1	15	45	6	12	0.0E+00	0.0E+00	0.029	0	0E+00	0E+00					
53	Carbon T	Carbon T	5.6	0.8	1.1	15	45	6	12	3.0E-04	1.4E-04	0.13	0.0007	6E-06	3E-01					
54	Chlorofo	Chlorofo	12	0.8	1.1	15	45	6	12	6.4E-04	2.9E-04	0.0061	0.01	6E-07	4E-02					
55	1,2-DCA	1,2-DCA	0.41	0.8	1.1	15	45	6	12	2.2E-05	1.0E-05	0.091	0	3E-07	0E+00					
56	TCE	TCE	56	0.8	1.1	15	45	6	12	3.0E-03	1.4E-03	0.011	0	5E-06	0E+00					
57	2,4-DNP	2,4-DNP	12	0.8	1.1	15	45	6	12	6.4E-04	2.9E-04	0	0.002	0E+00	2E-01					
58	2,4-DNT	2,4-DNT	6.4	0.8	1.1	15	45	6	12	3.4E-04	1.6E-04	0.68	0.001	4E-05	2E-01					
59	HMX	HMX	3.1	0.8	1.1	15	45	6	12	1.7E-04	7.6E-05	0	0.05	0E+00	2E-03					
60	RDX	RDX	110	0.8	1.1	15	45	6	12	5.9E-03	2.7E-03	0.11	0.002	1E-04	2E+00					
61	Tetryl	Tetryl	1.2	0.8	1.1	15	45	6	12	6.4E-05	2.9E-05	0	0	0E+00	0E+00					
62	1,3,5-TN	1,3,5-TN	67	0.8	1.1	15	45	6	12	3.6E-03	1.6E-03	0	5E-05	0E+00	5E+01					
63	2,4,6-TN	2,4,6-TN	2.9	0.8	1.1	15	45	6	12	1.5E-04	7.1E-05	0.03	0.0005	8E-07	2E-01					
64																				
65													TOTAL:	4E-04	5E+01					
66			SHOWER INHALATION EXPOSURE MODEL																	
67																				
68	Chemica	Chemica	V	V	W	W	Dt	Ra	S	Ds	Cwd	FR	SV	Cwo	Kal	ts	d	Kl	Tl	Ts
69			Age 0-5	Age 6-1	Age 0-5	Age 6-1	(min)	(min^-1)	(ug/m^3-	(min)	(ug/l)	(l/min)	(m^3)	(ug/l)	(cm/hr)	(sec)	(mm)	(dless)	(degK)	(degK
70			(L/min)	(L/min)	(kg)	(kg)			min)											
71																				
72	Benzene	Benzene	14	18	15	45	20	0.0083	0.00	15	0.0E+00	22.5	5.66	0	19.34	2	1	14.65	293	316
73	Carbon T	Carbon T	14	18	15	45	20	0.0083	8.33	15	2.1E+00	22.5	5.66	5.6	14.05	2	1	10.65	293	316
74	Chlorofo	Chlorofo	14	18	15	45	20	0.0083	19.43	15	4.9E+00	22.5	5.66	12	15.69	2	1	11.89	293	316
75	1,2-DCA	1,2-DCA	14	18	15	45	20	0.0083	0.68	15	1.7E-01	22.5	5.66	0.41	16.05	2	1	12.16	293	316
76	TCE	TCE	14	18	15	45	20	0.0083	88.00	15	2.2E+01	22.5	5.66	56	15.09	2	1	11.43	293	316
77																				
78																				
79																				
80																				
81																				

	1	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
1																			
2																			
3																			
4																			
5																			
6																			
7	Chemica																		
8																			
9																			
10																			
11	Arsenic																		
12	Chromiu																		
13	Mercury																		
14	Seleniun																		
15	Benzene																		
16	Carbon T																		
17	Chlorofo																		
18	1,2-DCA																		
19	TCE																		
20	2,4-DNP																		
21	2,4-DNT																		
22	HMX																		
23	RDX																		
24	Tetryl																		
25	1,3,5-TN																		
26	2,4,6-TN																		
27																			
28																			
29															Total	Total			
30											Inhal	Inhal	Cancer	Hazard	Cancer	Hazard			
31	Chemica	t(VOC)	R	T	H	kg(VOC)	Kl(CO2)	Kg(H2O)	MW	Dose	CPF	RfD	Risk	Index	Risk	Index			
32		(cm/hr)	m3-atm	(deg K)	m3-atm	(cm/hr)	(cm/hr)	(cm/hr)	g/mol	mg/kg/shr)									
33			mol-K)		mol)														
34	Benzene	15.02	#####	293	0.01	1441	20	3000	78	0.00E+00	#####	1.4E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00			
35	Carbon T	10.69	#####	293	0.063	1026	20	3000	154	2.11E-04	#####	7.0E-04	1.2E-05	3.0E-01	2.1E-05	5.3E-01			
36	Chlorofo	12.16	#####	293	0.011	1167	20	3000	119	4.91E-04	#####	0.01	1.7E-05	4.9E-02	1.8E-05	8.3E-02			
37	1,2-DCA	13.33	#####	293	0.0026	1279	20	3000	99	1.71E-05	#####	0.0E+00	6.7E-07	0.0E+00	1.1E-06	0.0E+00			
38	TCE	11.57	#####	293	0.021	1110	20	3000	131.5	2.23E-03	#####	0.0E+00	1.6E-05	0.0E+00	2.4E-05	0.0E+00			
39																			
40												TOTAL:	5E-05	4E-01					
41																			
42											TOTAL CANCER RISK			6E-04					
43											TOTAL HAZARD INDEX			4E+01					
44	Chemica																		
45																			
46																			
47																			
48	Arsenic																		
49	Chromiu																		

	1	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
50	Mercury																		
51	Selenium																		
52	Benzene																		
53	Carbon T																		
54	Chlorofo																		
55	1,2-DCA																		
56	TCE																		
57	2,4-DNP																		
58	2,4-DNT																		
59	HMX																		
60	RDX																		
61	Tetryl																		
62	1,3,5-TN																		
63	2,4,6-TN																		
64																			
65																			
66																			
67																			
68	Chemica	u1	us	k1(VOC)	R	T	H	kg(VOC)	Kl(CO2)	Kg(H2O)	MW	Residence	Residence	Dose	Dose	Inhal	Inhal	Cancer	Haz
69		(cp)	(cp)	(cm/hr)	m3-atm	(deg K)	m3-atm	(cm/hr)	[illegible]n/hr	(cm/hr)	(g/mol)	Age 0-5	Age 6-17	Age 0-5	Age 6-17	CPF	RfD	Risk	Index
70					mol-K)		mol)							(mg/kg/	(mg/kg/				
71														shr)	shr)				
72	Benzene	1.002	0.6178	15.02	#####	293	0.01	1441	20	3000	78	6	12	0.00E+00	0.00E+00	2.9E-02	####	0E+00	0E+00
73	Carbon T	1.002	0.6178	10.69	#####	293	0.063	1026	20	3000	154	6	12	1.38E-03	5.90E-04	1.3E-01	####	3E-05	1E+00
74	Chlorofo	1.002	0.6178	12.16	#####	293	0.011	1167	20	3000	119	6	12	3.21E-03	1.38E-03	8.1E-02	####	4E-05	2E-01
75	1,2-DCA	1.002	0.6178	13.33	#####	293	0.0026	1279	20	3000	99	6	12	1.12E-04	4.78E-05	9.1E-02	0E+00	2E-06	0E+00
76	TCE	1.002	0.6178	11.57	#####	293	0.021	1110	20	3000	131.5	6	12	1.45E-02	6.23E-03	1.7E-02	0E+00	4E-05	0E+00
77																			
78																	TOTAL	1E-04	1E+00
79																			
80																TOTAL CANCER RISK			5E-04
81																TOTAL HAZARD INDEX			5E+01

	1	38	39
1			
2			
3			
4			
5			
6			
7	Chemica		
8			
9			
10			
11	Arsenic		
12	Chromiu		
13	Mercury		
14	Seleniun		
15	Benzene		
16	Carbon T		
17	Chlorofo		
18	1,2-DCA		
19	TCE		
20	2,4-DNP		
21	2,4-DNT		
22	HMX		
23	RDX		
24	Tetryl		
25	1,3,5-TN		
26	2,4,6-TN		
27			
28			
29			
30			
31	Chemica		
32			
33			
34	Benzene		
35	Carbon T		
36	Chlorofo		
37	1,2-DCA		
38	TCE		
39			
40			
41			
42			
43			
44	Chemica		
45			
46			
47			
48	Arsenic		
49	Chromiu		

	1	38	39
50	Mercury		
51	Seleniun		
52	Benzene		
53	Carbon T		
54	Chlorofo		
55	1,2-DCA		
56	TCE		
57	2,4-DNP		
58	2,4-DNT		
59	HMX		
60	RDX		
61	Tetryl		
62	1,3,5-TN		
63	2,4,6-TN		
64			
65			
66			
67		Total	Total
68	Chemica	Cancer	Hazard
69		Risk	Index
70			
71			
72	Benzene	####	####
73	Carbon T	####	####
74	Chlorofo	####	####
75	1,2-DCA	####	####
76	TCE	####	####
77			
78			
79			
80			
81			

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1							Table Q4-7							
2					Calculated Risk Estimates For Casual Visitor - ALF Soil									
3														
4	ABANDONED LANDFILL - CASUAL VISITOR													
5	WIND EROSION - UNLIMITED EROSION POTENTIAL													
6														
7			mean wind	thresh wind										
8		veg cover (V)	speed (u)	speed (u(t))	F(x)	PM10 EMS	Area							
9			(cm/s)	(cm/s)		(g/m2-hr)	(m2)							
10														
11		0.7	194	40	1.91	2.4	187000							
12														
13					Crosswind									
14	Chemical	Concentration	Cont. Emis	Box Height	Width	Wind Speed	Contam Conc	Hrs/day	Inhal Rate	Expos Dose	SF	RfD	Cancer Risk	Haz Index
15		(ug/g)	(ug/hr)	(m)	(m)	(m/s)	(mg/m3)		(m3/hr)	(mg/kg/day)	mg/kg/day-1	(mg/kg/day)		
16														
17	Cadmium	6.18	2.7E+06	2	500	1.94	3.9E-04	1	0.6	2.2E-07	6.1	0	3.9E-07	0.0E+00
18	Chromium	48.4	2.1E+07	2	500	1.94	3.0E-03	1	0.6	1.7E-06	41	0	2.0E-05	0.0E+00
19	Lead	440	1.9E+08	2	500	1.94	2.8E-02	1	0.6	1.6E-05	0	0	0.0E+00	0.0E+00
20	Nickel	43.6	1.9E+07	2	500	1.94	2.7E-03	1	0.6	1.6E-06	0	0.02	0.0E+00	7.8E-05
21	Selenium	0.441	1.9E+05	2	500	1.94	2.8E-05	1	0.6	1.6E-08	0	0.003	0.0E+00	5.3E-06
22	Zinc	1090	4.8E+08	2	500	1.94	6.9E-02	1	0.6	3.9E-05	0	0.2	0.0E+00	2.0E-04
23	TCDD	0.000035	1.5E+01	2	500	1.94	2.2E-09	1	0.6	1.3E-12	156000	0	5.6E-08	0.0E+00
24	HpCDD	0.00017	7.5E+01	2	500	1.94	1.1E-08	1	0.6	6.1E-12	1560	0	2.7E-09	0.0E+00
25	OCDD	0.00022	9.7E+01	2	500	1.94	1.4E-08	1	0.6	7.9E-12	156	0	3.5E-10	0.0E+00
26	TCDF	0.00032	1.4E+02	2	500	1.94	2.0E-08	1	0.6	1.2E-11	15600	0	5.1E-08	0.0E+00
27	PeCDF	0.000021	9.2E+00	2	500	1.94	1.3E-09	1	0.6	7.6E-13	78000	0	1.7E-08	0.0E+00
28	HxCDF	0.000082	3.6E+01	2	500	1.94	5.2E-09	1	0.6	3.0E-12	15600	0	1.3E-08	0.0E+00
29	HpCDF	0.00013	5.7E+01	2	500	1.94	8.2E-09	1	0.6	4.7E-12	1560	0	2.1E-09	0.0E+00
30														
31												TOTAL:	2E-05	3E-04
32	SOIL INGESTION													
33										Total	Total			
34	Chemical	Concentration	Soil Ing Rate	Expos. Freq	Exposure Dose	SF	RfD	Cancer Risk	Haz. Index	Cancer Risk	Haz Index			
35		(ug/g)	(g/day)	(dy/mnth)	(mg/kg/day)	mg/kg/day-1	(mg/kg/day)							
36														
37	Cadmium	6.18	0.01	2	5.9E-08	0	0.001	0.0E+00	5.9E-05	3.878E-07	6E-05			
38	Chromium	48.4	0.01	2	4.6E-07	0	0.005	0.0E+00	9.2E-05	2.041E-05	9E-05			
39	Lead	440	0.01	2	4.2E-06	0	0	0.0E+00	0.0E+00	0	0E+00			
40	Nickel	43.6	0.01	2	4.2E-07	0	0.02	0.0E+00	2.1E-05	0	1E-04			
41	Selenium	0.441	0.01	2	4.2E-09	0	0.003	0.0E+00	1.4E-06	0	7E-06			
42	Zinc	1090	0.01	2	1.0E-05	0	0.2	0.0E+00	5.2E-05	0	2E-04			
43	TCDD	0.000035	0.01	2	3.3E-13	156000	0	1.5E-08	0.0E+00	7.103E-08	0E+00			
44	HpCDD	0.00017	0.01	2	1.6E-12	1560	0	7.2E-10	0.0E+00	3.45E-09	0E+00			
45	OCDD	0.00022	0.01	2	2.1E-12	156	0	9.3E-11	0.0E+00	4.465E-10	0E+00			
46	TCDF	0.00032	0.01	2	3.0E-12	15600	0	1.4E-08	0.0E+00	6.494E-08	0E+00			
47	PeCDF	0.000021	0.01	2	2.0E-13	78000	0	4.5E-09	0.0E+00	2.131E-08	0E+00			
48	HxCDF	0.000082	0.01	2	7.8E-13	15600	0	3.5E-09	0.0E+00	1.664E-08	0E+00			

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
49	HpCDF	0.00013	0.01	2	1.2E-12	1560	0	5.5E-10	0.0E+00	2.638E-09	0E+00			
50														
51							TOTAL:	4E-08	2E-04					
52											TOTAL CANCER RISK			2E-05
53											TOTAL HAZARD INDEX			5E-04

	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1								Table Q4-8								
2								Calculated Risk Estimates For Worker - ALF Soil								
3																
4	ABANDONE	ABANDONED LANDFILL - WORKER														
5	DUST GENE	DUST GENERATED BY BACKHOE (TRACTOR SURROGATE)														
6																
7	Fraction of	Fraction of	Percent	PM10	PM10	Area	Daily PM10									
8	PM10 (k)	PM10 (k)	Silt (s)	Emissions	Emissions	Trenched	Emissions									
9				(kg/hectare)	(kg/m2)	(m2/day)	(kg/day)									
10	0.21	0.21	20	7.7E+02	7.7E-02	100	7.7E+00									
11																
12						Crosswind		Chemical	Work					Cancer	Hazard	
13	Chemical	Chemical	Concentration	Cont. Emis	Box Height	Width	Wind Speed	Concen	Period	Inhal Rate	Expos Dose	SF	RfD	Risk	Index	
14			(mg/kg)	(mg/day)	(m)	(m)	(m/s)	(mg/m3)	(hrs/day)	(m3/hr)	(mg/kg/	(mg/kg/	(mg/kg/			
15											day)	day-1)	day)			
16	Cadmium	Cadmium	6.18	4.7E+01	3	1	1.94	9.41E-05	8	0.6	2.3E-06	6.1	0	2.0E-07	0.0E+00	
17	Chromium	Chromium	48.4	3.7E+02	3	1	1.94	7.37E-04	8	0.6	1.8E-05	41	0	1.1E-05	0.0E+00	
18	Lead	Lead	440	3.4E+03	3	1	1.94	6.70E-03	8	0.6	1.6E-04	0	0	0.0E+00	0.0E+00	
19	Nickel	Nickel	43.6	3.3E+02	3	1	1.94	6.64E-04	8	0.6	1.6E-05	0	0.02	0.0E+00	8.1E-04	
20	Selenium	Selenium	0.441	3.4E+00	3	1	1.94	6.71E-06	8	0.6	1.6E-07	0	0.003	0.0E+00	5.5E-05	
21	Zinc	Zinc	1090	8.3E+03	3	1	1.94	1.66E-02	8	0.6	4.1E-04	0	0.2	0.0E+00	2.0E-03	
22	TCDD	TCDD	0.000035	2.7E-04	3	1	1.94	5.33E-10	8	0.6	1.3E-11	156000	0	2.9E-08	0.0E+00	
23	HpCDD	HpCDD	0.00017	1.3E-03	3	1	1.94	2.59E-09	8	0.6	6.3E-11	1560	0	1.4E-09	0.0E+00	
24	OCDD	OCDD	0.00022	1.7E-03	3	1	1.94	3.35E-09	8	0.6	8.2E-11	156	0	1.8E-10	0.0E+00	
25	TCDF	TCDF	0.00032	2.4E-03	3	1	1.94	4.87E-09	8	0.6	1.2E-10	15600	0	2.7E-08	0.0E+00	
26	PeCDF	PeCDF	0.000021	1.6E-04	3	1	1.94	3.20E-10	8	0.6	7.8E-12	78000	0	8.7E-09	0.0E+00	
27	HxCDF	HxCDF	0.000082	6.3E-04	3	1	1.94	1.25E-09	8	0.6	3.0E-11	15600	0	6.8E-09	0.0E+00	
28	HpCDF	HpCDF	0.00013	9.9E-04	3	1	1.94	1.98E-09	8	0.6	4.8E-11	1560	0	1.1E-09	0.0E+00	
29																
30													TOTAL:	1E-05	3E-03	
31																
32	SOIL INGES	SOIL INGESTION														
33					Work						Total	Total				
34	Chemical	Chemical	Concentration	Soil Ing. Rate	Rate	Exposure Dose	SF	RfD	Cancer	Hazard	Cancer	Hazard				
35			(mg/kg)	(g/day)	(days/day)	(mg/kg/day)	mg/kg/day-1	(mg/kg/	Risk	Index	Risk	Index				
36								day)								
37	Cadmium	Cadmium	6.18	0.48	0.36	1.5E-05	6.1	0	1.3E-06	0.0E+00	2E-06	0E+00				
38	Chromium	Chromium	48.4	0.48	0.36	1.2E-04	41	0	6.9E-05	0.0E+00	8E-05	0E+00				
39	Lead	Lead	440	0.48	0.36	1.1E-03	0	0	0.0E+00	0.0E+00	0	0E+00				
40	Nickel	Nickel	43.6	0.48	0.36	1.1E-04	0	0.02	0.0E+00	5.3E-03	0	6E-03				
41	Selenium	Selenium	0.441	0.48	0.36	1.1E-06	0	0.003	0.0E+00	3.6E-04	0	4E-04				
42	Zinc	Zinc	1090	0.48	0.36	2.7E-03	0	0.2	0.0E+00	1.3E-02	0	2E-02				
43	TCDD	TCDD	0.000035	0.48	0.36	8.5E-11	156000	0	1.9E-07	0.0E+00	2E-07	0E+00				
44	HpCDD	HpCDD	0.00017	0.48	0.36	4.2E-10	1560	0	9.3E-09	0.0E+00	1E-08	0E+00				
45	OCDD	OCDD	0.00022	0.48	0.36	5.4E-10	156	0	1.2E-09	0.0E+00	1E-09	0E+00				
46	TCDF	TCDF	0.00032	0.48	0.36	7.8E-10	15600	0	1.7E-07	0.0E+00	1E-05	0E+00				
47	PeCDF	PeCDF	0.000021	0.48	0.36	5.1E-11	78000	0	5.7E-08	0.0E+00	6E-08	0E+00				
48	HxCDF	HxCDF	0.000082	0.48	0.36	2.0E-10	15600	0	4.5E-08	0.0E+00	4E-08	0E+00				

	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
49	HpCDF	HpCDF	0.00013	0.48	0.36	3.2E-10	1560	0	7.1E-09	0.0E+00	8E-09	0E+00				
50																
51								TOTAL:	7E-05	2E-02			TOTAL CANCER RISK			8E-05
52													TOTAL HAZARD INDEX			2E-02
53	OSHA DUST	OSHA DUST INHALATION SCENARIO														
54								Work	Work	Exposure					Total	Total
55	Chemical	Chemical	Concentratio	Soil Conc	PM10 Conc	Chem Conc	Inhal Rate	Day	Rate	Dose	SF	RfD	Cancer	Hazard	Cancer	Hazard
56			(mg/kg)	(mg/m3)	(mg/m3)	(mg/m3)	(m3/hr)	(hrs/day)	(days/day)	(mg/kg/	(mg/kg/	(mg/kg/	Risk	Index	Risk	Index
57										day)	day-1)	day)				
58	Cadmium	Cadmium	6.18	10	2.1	1.3E-05	0.6	8	0.36	3.2E-07	6.1	0	2.8E-08	0.0E+00	1E-08	0E+00
59	Chromium	Chromium	48.4	10	2.1	1.0E-04	0.6	8	0.36	2.5E-06	41	0	1.5E-06	0.0E+00	7E-05	0E+00
60	Lead	Lead	440	10	2.1	9.2E-04	0.6	8	0.36	2.3E-05	0	0	0.0E+00	0.0E+00	0	0E+00
61	Nickel	Nickel	43.6	10	2.1	9.2E-05	0.6	8	0.36	2.2E-06	0	0.02	0.0E+00	1.1E-04	0	5E-03
62	Selenium	Selenium	0.441	10	2.1	9.3E-07	0.6	8	0.36	2.3E-08	0	0.003	0.0E+00	7.5E-06	0	4E-04
63	Zinc	Zinc	1090	10	2.1	2.3E-03	0.6	8	0.36	5.6E-05	0	0.2	0.0E+00	2.8E-04	0	1E-02
64	TCDD	TCDD	0.000035	10	2.1	7.4E-11	0.6	8	0.36	1.8E-12	156000	0	4.0E-09	0.0E+00	2E-07	0E+00
65	HpCDD	HpCDD	0.00017	10	2.1	3.6E-10	0.6	8	0.36	8.7E-12	1560	0	1.9E-10	0.0E+00	9E-09	0E+00
66	OCDD	OCDD	0.00022	10	2.1	4.6E-10	0.6	8	0.36	1.1E-11	156	0	2.5E-11	0.0E+00	1E-09	0E+00
67	TCDF	TCDF	0.00032	10	2.1	6.7E-10	0.6	8	0.36	1.6E-11	15600	0	3.7E-09	0.0E+00	2E-07	0E+00
68	PeCDF	PeCDF	0.000021	10	2.1	4.4E-11	0.6	8	0.36	1.1E-12	78000	0	1.2E-09	0.0E+00	6E-08	0E+00
69	HxCDF	HxCDF	0.000082	10	2.1	1.7E-10	0.6	8	0.36	4.2E-12	15600	0	9.4E-10	0.0E+00	5E-08	0E+00
70	HpCDF	HpCDF	0.00013	10	2.1	2.7E-10	0.6	8	0.36	6.7E-12	1560	0	1.5E-10	0.0E+00	7E-09	0E+00
71																
72												TOTAL:	1E-06	4E-04		
73																
74													TOTAL CANCER RISK			7E-05
75													TOTAL HAZARD INDEX			2E-02

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1							Table Q4-9							
2							Calculated Risk Estimates For Casual Visitor - CCB Soil							
3														
4	CHEMICAL BURIAL SITE													
5														
6	WIND EROSION - UNLIMITED EROSION POTENTIAL													
7														
8			mean wind	thresh wind										
9		veg cover (V)	speed (u)	speed (u(t))	F(x)	PM10 EMS	Area							
10			(cm/s)	(cm/s)		(g/m2-hr)	(m2)							
11														
12		0.5	194	40	1.91	3.9	5100							
13														
14					Crosswind									
15	Chemical	Concentration	Cont Emis	Box Height	Width	Wind Speed	Contam Conc	Hrs/day	Inhal Rate	Expos Dose	SF	RfD	Cancer Risk	Haz Index
16		(ug/g)	(ug/hr)	(m)	(m)	(m/s)	(mg/m3)		(m3/hr)	(mg/kg/day)	mg/kg/day-1	(mg/kg/day)		
17														
18	TCRM	0.009	1.8E+02	2	27	1.94	4.77E-07	1	0.6	2.7E-10	0	0.3	0E+00	9E-10
19	Chlordane	1.04	2.1E+04	2	27	1.94	5.52E-05	1	0.6	3.2E-08	1.3	0.00006	1E-08	5E-04
20	Heptachlo	0.007	1.4E+02	2	27	1.94	3.71E-07	1	0.6	2.1E-10	4.5	0.0005	3E-10	4E-07
21	Heptachlor	0.006	1.2E+02	2	27	1.94	3.18E-07	1	0.6	1.8E-10	9.1	0.0005	5E-1(	4E-07
22														
23												TOTAL:	1E-08	5E-04
24														
25	SOIL INGESTION													
26					Exposure									
27	Chemical	Concentration	Soil Ing Rate	Days/month	Dose	SF	RfD	Cancer Risk	Haz Index	Total	Total			
28		(ug/g)	(g/day)		(mg/kg/day)	mg/kg/day-1	(mg/kg/day)			Cancer Risk	Hazard Index			
29														
30	TCRM	0.009	0.01	2	8.6E-11	0	0.3	0E+00	3E-10	0E+00	1E-09			
31	Chlordane	1.04	0.01	2	9.9E-09	1.3	0.00006	4E-09	2E-04	2E-08	7E-04			
32	Heptachlo	0.007	0.01	2	6.7E-11	4.5	0.0005	9E-11	1E-07	1E-08	5E-04			
33	Heptachlor	0.006	0.01	2	5.7E-11	9.1	0.0005	1E-10	1E-07	4E-10	5E-07			
34														
35							TOTAL:	4E-09	2E-04					
36														
37												TOTAL CANCER RISK		2E-08
38												TOTAL HAZARD INDEX		7E-04

	1	1	2	3	4	5	6	7	8	9	10	11	12	13
1							Table Q4-10							
2							Calculated Risk Estimates For Worker - CCB Soil							
3														
4	CHEMICAL BURIA	CHEMICAL BURIAL SITE - WORKER												
5	DUST GENERATE	DUST GENERATED BY BACKHOE (TRACTOR SURROGATE)												
6														
7	Fraction of	Fraction of	Percent	PM10	PM10	Area	Daily PM10							
8	PM10 (k)	PM10 (k)	Silt (s)	Emissions	Emissions	Trenched	Emissions							
9				(kg/hectare)	(kg/m2)	(m2/day)	(kg/day)							
10	0.21	0.21	20	7.7E+02	7.7E-02	100	7.7E+00							
11														
12						Crosswind		Chemical	Work					Cancer
13	Chemical	Chemical	Concentratio	Cont Emis	Box Height	Width	Wind Speed	Concen	Period	Inhal Rate	Expos Dos	SF	RfD	Risk
14			(mg/kg)	(mg/day)	(m)	(m)	(m/s)	(mg/m3)	(hrs/day)	(m3/hr)	(mg/kg/	(mg/kg/	(mg/kg/	
15											day)	day-1)	day)	
16	TCFM	TCFM	0.009	6.9E-02	3	1	1.94	1.37E-07	8	0.6	3.3E-09	0	0.7	0.0E+00
17	Chlordane	Chlordane	1.04	8.0E+00	3	1	1.94	1.58E-05	8	0.6	3.9E-07	1.3	0.00006	7.2E-09
18	Heptachlor	Heptachlor	0.007	5.4E-02	3	1	1.94	1.07E-07	8	0.6	2.6E-09	4.5	0.0005	1.7E-10
19	Heptachlor Epoxi	Heptachlor Epoxi	0.006	4.6E-02	3	1	1.94	9.13E-08	8	0.6	2.2E-09	9.1	0.0005	2.9E-10
20														
21													TOTAL:	8E-09
22														
23	SOIL INGESTION	SOIL INGESTION												
24					Work						Total	Total		
25	Chemical	Chemical	Concentratio	Soil Ing Rate	Rate	Exposure Dose	SF	RfD	Cancer	Hazard	Cancer	Hazard		
26			(mg/kg)	(g/day)	(days/day)	(mg/kg/day)	mg/kg/day-1	(mg/kg/	Risk	Index	Risk	Index		
27								day)						
28	TCFM	TCFM	0.009	0.48	0.36	2.2E-08	0	0.7	0.0E+00	3.1E-08	0	4E-08		
29	Chlordane	Chlordane	1.04	0.48	0.36	2.5E-06	1.3	0.00006	4.7E-08	4.2E-02	5E-08	5E-02		
30	Heptachlor	Heptachlor	0.007	0.48	0.36	1.7E-08	4.5	0.0005	1.1E-09	3.4E-05	8E-09	6E-03		
31	Heptachlor Epoxi	Heptachlor Epoxi	0.006	0.48	0.36	1.5E-08	9.1	0.0005	1.9E-09	2.9E-05	2E-09	3E-05		
32														
33								TOTAL:	5E-08	4E-02			TOTAL CANCER RIS	
34													TOTAL HAZARD IND	
35	OSHA DUST INHA	OSHA DUST INHALATION SCENARIO												
36								Work	Work	Exposure				
37	Chemical	Chemical	Concentratio	Soil Conc	PM10 Conc	Chem Conc	Inhal Rate	Day	Rate	Dose	SF	RfD	Cancer	Hazard
38			(mg/kg)	(mg/m3)	(mg/m3)	(mg/m3)	(m3/hr)	(hrs/day)	(days/day	(mg/kg/	(mg/kg/	(mg/kg/	Risk	Index
39										day)	day-1)	day)		
40	TCFM	TCFM	0.009	10	2.1	1.9E-08	0.6	8	0.36	4.6E-10	0	0.7	0.0E+00	6.6E-10
41	Chlordane	Chlordane	1.04	10	2.1	2.2E-06	0.6	8	0.36	5.3E-08	1.3	0.00006	9.9E-10	8.9E-04
42	Heptachlor	Heptachlor	0.007	10	2.1	1.5E-08	0.6	8	0.36	3.6E-10	4.5	0.0005	2.3E-11	7.2E-07
43	Heptachlor	Heptachlor	0.006	10	2.1	1.3E-08	0.6	8	0.36	3.1E-10	9.1	0.0005	4.0E-11	6.2E-07
44														
45												TOTAL:	1E-09	9E-04
46														
47													TOTAL CANCER RIS	
48													TOTAL HAZARD IND	

	1	14	15
1			
2			
3			
4	CHEMICAL BURI/		
5	DUST GENERATEI		
6			
7	Fraction of		
8	PM10 (k)		
9			
10	0 21		
11			
12		Hazard	
13	Chemical	Index	
14			
15			
16	TCRM	4 8E-09	
17	Chlordane	6 4E-03	
18	Heptachlor	5 2E-06	
19	Heptachlor Epoxi	4 5E-06	
20			
21		6E-03	
22			
23	SOIL INGESTION		
24			
25	Chemical		
26			
27			
28	TCRM		
29	Chlordane		
30	Heptachlor		
31	Heptachlor Epoxi		
32			
33		K	6E-08
34		EX	5E-02
35	OSHA DUST INHA		
36		Total	Total
37	Chemical	Cancer	Hazard
38		Risk	Index
39			
40	TCRM	0	3E-08
41	Chlordane	5E-08	4E-02
42	Heptachlor	1E-09	3E-05
43	Heptachlor	2E-09	3E-05
44			
45			
46			
47		K	5E-08
48		EX	4E-02

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1							Table Q4-11							
2				Calculated Risk Estimates For Casual Visitor - DRMO Soil										
3														
4	DRMO TRENCH - CASUAL VISITOR													
5	WIND EROSION - UNLIMITED EROSION POTENTIAL													
6														
7			mean wind	thresh wind										
8		veg	speed (u)	speed (u(t))	F(x)	PM10 EMS	Area							
9		cover (V)	(cm/s)	(cm/s)		(g/m2-hr)	(m2)							
10														
11		0.7	194	40	1.91	2.4	187000							
12														
13					Crosswind									
14	Chemical	Conc	Cont. Emis	Box Height	Width	Wind Speed	Contam Conc	Hrs/day	Inhal Rate	Expos Dose	SF	RfD	Cancer Risk	Haz. Index
15		(ug/g)	(ug/hr)	(m)	(m)	(m/s)	(mg/m3)		(m3/hr)	(mg/kg/day)	(mg/kg/day)-1	(mg/kg/day)		
16														
17	Barium	299	1.3E+08	2	500	1.94	1.9E-02	1	0.6	1.1E-05	0	0.0001	0.0E+00	1.1E-01
18	Molybdenum	2.09	9.2E+05	2	500	1.94	1.3E-04	1	0.6	7.5E-08	0	0	0.0E+00	0.0E+00
19	Vanadium	99.3	4.4E+07	2	500	1.94	6.3E-03	1	0.6	3.6E-06	0	0.007	0.0E+00	5.1E-04
20	1.2-DCB	76.6	3.4E+07	2	500	1.94	4.8E-03	1	0.6	2.8E-06	0.04	0	3.2E-08	0.0E+00
21	1.3-DCB	122	5.4E+07	2	500	1.94	7.7E-03	1	0.6	4.4E-06	0	0	0.0E+00	0.0E+00
22	1.4-DCB	23.6	1.0E+07	2	500	1.94	1.5E-03	1	0.6	8.5E-07	0	0.2	0.0E+00	4.2E-06
23	Aldrin	0.058	2.6E+04	2	500	1.94	3.7E-06	1	0.6	2.1E-09	1.7E+01	0.00003	1.0E-08	7.0E-05
24	DDD	2.25	9.9E+05	2	500	1.94	1.4E-04	1	0.6	8.1E-08	0.0E+00	0	0.0E+00	0.0E+00
25	DDT	2.53	1.1E+06	2	500	1.94	1.6E-04	1	0.6	9.1E-08	3.4E-01	0.0005	8.8E-09	1.8E-04
26	Benzene	1.09	4.8E+05	2	500	1.94	6.9E-05	1	0.6	3.9E-08	0.029	0.0014	3.3E-10	2.8E-05
27	Chlorobenze	24.5	1.1E+07	2	500	1.94	1.5E-03	1	0.6	8.8E-07	0	0.006	0.0E+00	1.5E-04
28	Chloroform	0.054	2.4E+04	2	500	1.94	3.4E-06	1	0.6	1.9E-09	0.081	0.01	4.5E-11	1.9E-07
29	1.2-Dichlorc	0.109	4.8E+04	2	500	1.94	6.9E-06	1	0.6	3.9E-09	0.091	0	1.0E-10	0.0E+00
30	1.1-DCE	0.156	6.9E+04	2	500	1.94	9.8E-06	1	0.6	5.6E-09	1.2	0	1.9E-09	0.0E+00
31	1.2-dichlorc	0.051	2.2E+04	2	500	1.94	3.2E-06	1	0.6	1.8E-09	0	0	0.0E+00	0.0E+00
32	Ethylbenzen	5.38	2.4E+06	2	500	1.94	3.4E-04	1	0.6	1.9E-07	0	0.1	0.0E+00	1.8E-06
33	CH2CL2	0.562	2.5E+05	2	500	1.94	3.5E-05	1	0.6	2.0E-08	0.014	0.9	8.1E-11	2.2E-08
34	1122-TCA	1.5	6.6E+05	2	500	1.94	9.5E-05	1	0.6	5.4E-08	0.2	0	3.1E-09	0.0E+00
35	PCE	1.7	7.5E+05	2	500	1.94	1.1E-04	1	0.6	6.1E-08	0.0033	0.01	5.8E-11	6.1E-06
36	Toluene	33	1.5E+07	2	500	1.94	2.1E-03	1	0.6	1.2E-06	0	0.6	0.0E+00	2.0E-06
37	111-TCA	1.44	6.3E+05	2	500	1.94	9.1E-05	1	0.6	5.2E-08	0	0.3	0.0E+00	1.7E-07
38	TCE	31.4	1.4E+07	2	500	1.94	2.0E-03	1	0.6	1.1E-06	0.017	0	5.5E-09	0.0E+00
39	Xylenes	29.1	1.3E+07	2	500	1.94	1.8E-03	1	0.6	1.0E-06	0	0.09	0.0E+00	1.2E-05
40														
41												TOTAL:	6E-08	1E-01
42	SOIL INGESTION													
43					Expos					Total	Total			
44	Chemical	Conc	Soil Ing. Rate	Expos. Freq	Dose	SF	RfD	Cancer Risk	Haz. Index	Cancer Risk	Haz Index			
45		(ug/g)	(g/day)	(dy/mnth)	mg/kg/day	mg/kg/day-1	(mg/kg/day)							
46														
47	Barium	299	0.01	2	2.8E-06	0	0.05	0.0E+00	5.7E-05	0E+00	1E-01			
48	Molybdenum	2.09	0.01	2	2.0E-08	0	0	0.0E+00	0.0E+00	0E+00	0E+00			
49	Vanadium	99.3	0.01	2	9.5E-07	0	0.007	0.0E+00	1.4E-04	0E+00	6E-04			
50	1.2-DCB	76.6	0.01	2	7.3E-07	0	0.09	0.0E+00	8.1E-06	3E-08	8E-06			
51	1.3-DCB	122	0.01	2	1.2E-06	0	0	0.0E+00	0.0E+00	0E+00	0E+00			
52	1.4-DCB	23.6	0.01	2	2.2E-07	0.024	0	1.5E-09	0.0E+00	2E-09	4E-06			
53	Aldrin	0.058	0.01	2	5.5E-10	1.7E+01	0.00003	2.7E-09	1.8E-05	1E-08	9E-05			
54	DDD	2.25	0.01	2	2.1E-08	2.4E-01	0	1.5E-09	0.0E+00	1E-09	0E+00			
55	DDT	2.53	0.01	2	2.4E-08	3.4E-01	0.0005	2.3E-09	4.8E-05	1E-08	2E-04			
56	Benzene	1.09	0.01	2	1.0E-08	0.029	0	8.6E-11	0.0E+00	4E-10	3E-05			
57	Chlorobenze	24.5	0.01	2	2.3E-07	0	0.02	0.0E+00	1.2E-05	0E+00	2E-04			
58	Chloroform	0.054	0.01	2	5.1E-10	0.0061	0.01	9.0E-13	5.1E-08	5E-11	2E-07			
59	1.2-Dichlore	0.109	0.01	2	1.0E-09	0.091	0	2.7E-11	0.0E+00	1E-10	0E+00			
60	1.1-DCE	0.156	0.01	2	1.5E-09	0.6	0.009	2.5E-10	1.7E-07	2E-09	2E-07			
61	1.2-dichlorc	0.051	0.01	2	4.9E-10	0.068	0	9.4E-12	0.0E+00	9E-12	0E+00			
62	Ethylbenzen	5.38	0.01	2	5.1E-08	0	0.1	0.0E+00	5.1E-07	0E+00	2E-06			
63	CH2CL2	0.562	0.01	2	5.4E-09	0.0075	0.06	1.1E-11	8.9E-08	9E-11	1E-07			
64	1122-TCA	1.5	0.01	2	1.4E-08	0.2	0	8.2E-10	0.0E+00	4E-09	0E+00			
65	PCE	1.7	0.01	2	1.6E-08	0.051	0.01	2.4E-10	1.6E-06	3E-10	6E-06			
66	Toluene	33	0.01	2	3.1E-07	0	0.3	0.0E+00	1.0E-06	0E+00	3E-06			
67	111-TCA	1.44	0.01	2	1.4E-08	0	0.09	0.0E+00	1.5E-07	0E+00	3E-07			
68	TCE	31.4	0.01	2	3.0E-07	0.011	0	9.4E-10	0.0E+00	6E-09	0E+00			
69	Xylenes	29.1	0.01	2	2.8E-07	0	2	0.0E+00	1.4E-07	0E+00	1E-05			
70														
71							TOTAL:	1E-08	3E-04					
72											TOTAL CANCER RISK			7E-08
73											TOTAL HAZARD INDEX			1E-01

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1							Table Q4-12							
2				Calculated Risk Estimates For Casual Visitor - TNT Leaching Beds Soil, Average										
3														
4	TNT LEACHING BEDS - CASUAL VISITOR													
5	WIND EROSION - UNLIMITED EROSION POTENTIAL													
6														
7			mean wind	thresh wind										
8		veg cover (V)	speed (u)	speed (u(t))	F(x)	PM10 EMS	Area							
9			(cm/s)	(cm/s)		(g/m2 hr)	(m2)							
10														
11		0	194	40	1 91	7 8	450							
12														
13					Crosswind									
14	Chemical	Concentration	Cont. Emis	Box Height	Width	Wind Speed	Contam Conc	Hrs/day	Inhal Rate	Expos Dose	SF	RfD	Cancer Risk	Haz Index
15		(ug/g)	(ug/hr)	(m)	(m)	(m/s)	(mg/m3)		(m3/hr)	(mg/kg/day)	mg/kg/day-1	mg/kg/day)		
16														
17	Vanadium	33	1 2E+05	2	24 4	1 94	3 4E-04	1	0 6	2 0E 07	0	0 007	0 0E+00	2 8E 05
18	2.4 DNT	4 7	1 7E+04	2	24 4	1 94	4 9E 05	1	0 6	2 8E 08	0 68	0 001	5 4E 09	2 8E 05
19	HMX	6.7	2 4E+04	2	24 4	1 94	6 9E 05	1	0 6	4 0E 08	0	0 05	0 0E+00	7 9E 07
20	RDX	260	9 2E+05	2	24 4	1 94	2 7E 03	1	0 6	1 5E 06	0 11	0 003	4 8E 08	5 1E 04
21	1,3,5-TNB	56	2 0E+05	2	24 4	1 94	5 8E-04	1	0 6	3 3E 07	0	0 00005	0 0E+00	6 6E 03
22	2,4,6-TNT	5200	1 8E+07	2	24 4	1 94	5 4E 02	1	0 6	3 1E 05	0 03	0 0005	2 6E 07	6 2E 02
23														
24												TOTAL:	3E-07	7E-02
25	SOIL INGESTION													
26										Total	Total			
27	Chemical	Concentration	Soil Ing Rate	Expos. Freq	Exposure Dose	SF	RfD	Cancer Risk	Haz Index	Cancer Risk	Haz Index			
28		(ug/g)	(g/day)	(dy/mnth)	(mg/kg/day)	mg/kg/day-1	(mg/kg/day)							
29														
30	Vanadium	33	0.01	2	3 1E-07	0	0.007	0 0E+00	4 5E-05	0E+00	7E-05			
31	2.4-DNT	4 7	0 01	2	4 5E-08	0.68	0.001	8 7E-09	4 5E-05	1E-08	7E-05			
32	HMX	6 7	0 01	2	6 4E-08	0	0.05	0 0E+00	1 3E-06	0E+00	2E-06			
33	RDX	260	0 01	2	2 5E 06	0 11	0 003	7 8E-08	8 3E-04	1E-07	1E-03			
34	1,3,5-TNB	56	0 01	2	5 3E-07	0	0.00005	0 0E+00	1 1E 02	0E+00	2E-02			
35	2,4,6-TNT	5200	0 01	2	5 0E-05	0 03	0.0005	4 2E-07	9 9E-02	7E-07	2E-01			
36														
37							TOTAL:	5E-07	1E-01					
38											TOTAL CANCER RISK			8E-07
39											TOTAL HAZARD INDEX			2E-01

Table Q4-13
Calculated Risk Estimates For Casual Visitor - TNT Leaching Beds Soil, RME

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1														
2														
3														
4	TNT LEACHING BEDS - CASUAL VISITOR													
5	WIND EROSION - UNLIMITED EROSION POTENTIAL													
6														
7			mean wind	thresh wind										
8		veg cover (V)	speed (u)	speed (u(t))	F(x)	PM10 EMS	Area							
9			(cm/s)	(cm/s)		(g/m2 hr)	(m2)							
10														
11		0	194	40	1.91	7.8	450							
12														
13					Crosswind									
14	Chemical	Concentration	Cont. Emis	Box Height	Width	Wind Speed	Contam Conc	Hrs/day	Inhal Rate	Expos Dose	SF	RfD	Cancer Risk	Haz. Index
15		(ug/g)	(ug/hr)	(m)	(m)	(m/s)	(mg/m3)		(m3/hr)	(mg/kg/day)	mg/kg/day-1	mg/kg/day)		
16														
17	Vanadium	38	1.3E+05	2	24.4	1.94	3.9E-04	1	0.6	2.2E-07	0	0.007	0.0E+00	3.2E-05
18	2,4-DNT	8.9	3.1E+04	2	24.4	1.94	9.2E-05	1	0.6	5.3E-08	0.68	0.001	1.0E-08	5.3E-05
19	HMX	11.5	4.1E+04	2	24.4	1.94	1.2E-04	1	0.6	6.8E-08	0	0.05	0.0E+00	1.4E-06
20	RDX	560	2.0E+06	2	24.4	1.94	5.8E-03	1	0.6	3.3E-06	0.11	0.003	1.0E-07	1.1E-03
21	1,3,5-TNB	87	3.1E+05	2	24.4	1.94	9.0E-04	1	0.6	5.1E-07	0	0.00005	0.0E+00	1.0E-02
22	2,4,6-TNT	8000	2.8E+07	2	24.4	1.94	8.3E-02	1	0.6	4.7E-05	0.03	0.0005	4.1E-07	9.5E-02
23														
24												TOTAL:	5E-07	1E-01
25	SOIL INGESTION													
26										Total	Total			
27	Chemical	Concentration	Soil Ing Rate	Expos Freq	Exposure Dose	SF	RfD	Cancer Risk	Haz Index	Cancer Risk	Haz Index			
28		(ug/g)	(g/day)	(dy/mnth)	(mg/kg/day)	mg/kg/day-1	(mg/kg/day)							
29														
30	Vanadium	38	0.01	2	3.6E-07	0	0.007	0.0E+00	5.2E-05	0E+00	8E-05			
31	2,4-DNT	8.9	0.01	2	8.5E-08	0.68	0.001	1.6E-08	8.5E-05	3E-08	1E-04			
32	HMX	11.5	0.01	2	1.1E-07	0	0.05	0.0E+00	2.2E-06	0E+00	4E-06			
33	RDX	560	0.01	2	5.3E-06	0.11	0.003	1.7E-07	1.8E-03	3E-07	3E-03			
34	1,3,5-TNB	87	0.01	2	8.3E-07	0	0.00005	0.0E+00	1.7E-02	0E+00	3E-02			
35	2,4,6-TNT	8000	0.01	2	7.6E-05	0.03	0.0005	6.5E-07	1.5E-01	1E-06	2E-01			
36														
37							TOTAL:	8E-07	2E-01					
38											TOTAL CANCER RISK			1E-06
39											TOTAL HAZARD INDEX			3E-01

	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1								Table Q4-14								
2					Calculated Risk Estimates For Worker - TNT Leaching Beds Soil, Average											
3																
4	TNT LEACH	TNT LEACHING BEDS - WORKER														
5	DUST GENE	DUST GENERATED BY BACKHOE (TRACTOR SURROGATE)														
6																
7	Fraction of	Fraction of	Percent	PM10	PM10	Area	Daily PM10									
8	PM10 (k)	PM10 (k)	Silt (s)	Emissions	Emissions	Trenched	Emissions									
9				(kg/hectare)	(kg/m2)	(m2/day)	(kg/day)									
10	0 21	0 21	20	7 7E+02	7 7E-02	100	7 7E+00									
11																
12						Crosswind		Chemical	Work					Cancer	Hazard	
13	Chemical	Chemical	Concentration	Cont. Emis	Box Height	Width	Wind Speed	Concen	Period	Inhal Rate	Expos Dose	SF	RfD	Risk	Index	
14			(mg/kg)	(mg/day)	(m)	(m)	(m/s)	(mg/m3)	(hrs/day)	(m3/hr)	(mg/kg/	(mg/kg/	(mg/kg/			
15											day)	day-1)	day)			
16																
17	Vanadium	Vanadium	33	2.5E+02	3	1	1 94	5 02E-04	8	0 6	1 2E 05	0	0 007	0 0E+00	1 8E 03	
18	2,4-DNT	2,4-DNT	4 7	3 6E+01	3	1	1 94	7 15E-05	8	0 6	1.7E 06	0.68	0 05	1 7E-08	3 5E 05	
19	HMX	HMX	6 7	5 1E+01	3	1	1 94	1.02E-04	8	0 6	2 5E-06	0	0 5	0 0E+00	5 0E 06	
20	RDX	RDX	260	2 0E+03	3	1	1 94	3 96E-03	8	0 6	9 7E 05	0 11	0 003	1 5E-07	3 2E 02	
21	1,3,5-TNB	1,3,5-TNB	56	4.3E+02	3	1	1 94	8 52E-04	8	0 6	2 1E 05	0	0 0005	0 0E+00	4 2E 02	
22	2,4,6-TNT	2,4,6-TNT	5200	4 0E+04	3	1	1 94	7 91E 02	8	0 6	1.9E-03	0 03	0 005	8 3E-07	3 9E 01	
23																
24													TOTAL:	1E-06	5E-01	
25																
26	SOIL INGES	SOIL INGESTION														
27					Work						Total	Total				
28	Chemical	Chemical	Concentration	Soil Ing. Rate	Rate	Exposure Dose	SF	RfD	Cancer	Hazard	Cancer	Hazard				
29			(mg/kg)	(g/day)	(days/day)	(mg/kg/day)	mg/kg/day-1	(mg/kg/	Risk	Index	Risk	Index				
30								day)								
31																
32	Vanadium	Vanadium	33	0 48	0 36	8 1E 05	0	0 007	0 0E+00	1 2E-02	0	1E-02				
33	2,4 DNT	2,4-DNT	4 7	0 48	0 36	1 1E-05	0 68	0.05	1 1E 07	2 3E-04	1E-07	3E-04				
34	HMX	HMX	6 7	0 48	0 36	1 6E-05	0	0 5	0 0E+00	3 3E-05	0	4E-05				
35	RDX	RDX	260	0 48	0 36	6 3E-04	0 11	0.003	1 0E-06	2.1E-01	1E-06	2E-01				
36	1,3,5-TNB	1,3,5-TNB	56	0 48	0 36	1 4E 04	0	0 0005	0 0E+00	2 7E-01	0	3E-01				
37	2,4,6-TNT	2,4,6-TNT	5200	0 48	0 36	1 3E-02	0 03	0 005	5 4E-06	2 5E+00	6E-06	3E+00				
38																
39								TOTAL:	7E-06	3E+00			TOTAL CANCER RISK			8E-06
40													TOTAL HAZARD INDEX			3E+00
41	OSHA DUS	OSHA DUST INHALATION SCENARIO														
42								Work	Work	Exposure					Total	Total
43	Chemical	Chemical	Concentration	Soil Conc	PM10 Conc	Chem Conc	Inhal Rate	Day	Rate	Dose	SF	RfD	Cancer	Hazard	Cancer	Hazard
44			(mg/kg)	(mg/m3)	(mg/m3)	(mg/m3)	(m3/hr)	(hrs/day)	(days/day)	(mg/kg/	(mg/kg/	(mg/kg/	Risk	Index	Risk	Index
45										day)	day 1)	day)				
46																
47	Vanadium	Vanadium	33	10	2 1	6 9E 05	0 6	8	0 36	1 7E 06	0	0 007	0 0E+00	2 4E 04	0	1E-02
48	2,4 DNT	2,4 DNT	4 7	10	2 1	9 9E 06	0 6	8	0 36	2 4E 07	0 68	0 05	2 3E 09	4 8E 06	1E-07	2E-04

	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
49	HMX	HMX	6 7	10	2 1	1 4E 05	0 6	8	0 36	3 4E 07	0	0 5	0.0E+00	6.9E-07	0	3E-05
50	RDX	RDX	260	10	2 1	5 5E 04	0 6	8	0 36	1.3E 05	0 11	0.003	2.1E-08	4 4E-03	1E-06	2E-01
51	1,3,5 TNB	1,3,5-TNB	56	10	2 1	1 2E 04	0 6	8	0 36	2.9E 06	0	0 0005	0.0E+00	5.7E-03	0	3E-01
52	2,4,6-TNT	2,4,6-TNT	5200	10	2 1	1.1E 02	0 6	8	0 36	2.7E 04	0 03	0.005	1.1E-07	5.3E-02	6E-06	3E+00
53																
54												TOTAL:	1E-07	6E-02		
55																
56													TOTAL CANCER RISK			7E-06
57													TOTAL HAZARD INDEX			3E+00

	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1							Table Q4-15									
2							Calculated Risk Estimates For Worker - TNT Leaching Beds Soil, RME									
3																
4	TNT LEACH	TNT LEACHING BEDS - WORKER														
5	DUST GENE	DUST GENERATED BY BACKHOE (TRACTOR SURROGATE)														
6																
7	Fraction of	Fraction of	Percent	PM10	PM10	Area	Daily PM10									
8	PM10 (k)	PM10 (k)	Silt (s)	Emissions	Emissions	Trenched	Emissions									
9				(kg/hectare)	(kg/m2)	(m2/day)	(kg/day)									
10	0.21	0.21	20	7.7E+02	7.7E-02	100	7.7E+00									
11																
12						Crosswind		Chemical	Work					Cancer	Hazard	
13	Chemical	Chemical	Concentratio	Cont. Emis	Box Height	Width	Wind Speed	Concen	Period	Inhal Rate	Expos Dose	SF	RfD	Risk	Index	
14			(mg/kg)	(mg/day)	(m)	(m)	(m/s)	(mg/m3)	(hrs/day)	(m3/hr)	(mg/kg/	(mg/kg/	(mg/kg/			
15											day)	day-1)	day)			
16																
17	Vanadium	Vanadium	38	2.9E+02	3	1	1.94	5.78E-04	8	0.6	1.4E-05	0	0.007	0.0E+00	2.0E-03	
18	2,4-DNT	2,4-DNT	8.9	6.8E+01	3	1	1.94	1.35E-04	8	0.6	3.3E-06	0.68	0.05	3.2E-08	6.6E-05	
19	HMX	HMX	11.5	8.8E+01	3	1	1.94	1.75E-04	8	0.6	4.3E-06	0	0.5	0.0E+00	8.5E-06	
20	RDX	RDX	560	4.3E+03	3	1	1.94	8.52E-03	8	0.6	2.1E-04	0.11	0.003	3.3E-07	6.9E-02	
21	1,3,5-TNB	1,3,5-TNB	87	6.7E+02	3	1	1.94	1.32E-03	8	0.6	3.2E-05	0	0.0005	0.0E+00	6.5E-02	
22	2,4,6-TNT	2,4,6-TNT	8000	6.1E+04	3	1	1.94	1.22E-01	8	0.6	3.0E-03	0.03	0.005	1.3E-06	5.9E-01	
23																
24													TOTAL:	2E-06	7E-01	
25																
26	SOIL INGES	SOIL INGESTION														
27					Work						Total	Total				
28	Chemical	Chemical	Concentratio	Soil Ing. Rate	Rate	Exposure Dose	SF	RfD	Cancer	Hazard	Cancer	Hazard				
29			(mg/kg)	(g/day)	(days/day)	(mg/kg/day)	mg/kg/day-1	(mg/kg/	Risk	Index	Risk	Index				
30								day)								
31																
32	Vanadium	Vanadium	38	0.48	0.36	9.3E-05	0	0.007	0.0E+00	1.3E-02	0	2E-02				
33	2,4-DNT	2,4-DNT	8.9	0.48	0.36	2.2E-05	0.68	0.05	2.1E-07	4.3E-04	2E-07	5E-04				
34	HMX	HMX	11.5	0.48	0.36	2.8E-05	0	0.5	0.0E+00	5.6E-05	0	6E-05				
35	RDX	RDX	560	0.48	0.36	1.4E-03	0.11	0.003	2.1E-06	4.6E-01	2E-06	5E-01				
36	1,3,5-TNB	1,3,5-TNB	87	0.48	0.36	2.1E-04	0	0.0005	0.0E+00	4.2E-01	0	5E-01				
37	2,4,6-TNT	2,4,6-TNT	8000	0.48	0.36	2.0E-02	0.03	0.005	8.4E-06	3.9E+00	1E-05	5E+00				
38																
39								TOTAL:	1E-05	5E+00			TOTAL CANCER RISK			1E-05
40													TOTAL HAZARD INDEX			6E+00
41	OSHA DUS	OSHA DUST INHALATION SCENARIO														
42								Work	Work	Exposure					Total	Total
43	Chemical	Chemical	Concentratio	Soil Conc	PM10 Conc	Chem Conc	Inhal Rate	Day	Rate	Dose	SF	RfD	Cancer	Hazard	Cancer	Hazard
44			(mg/kg)	(mg/m3)	(mg/m3)	(mg/m3)	(m3/hr)	(hrs/day)	(days/day)	(mg/kg/	(mg/kg/	(mg/kg/	Risk	Index	Risk	Index
45										day)	day-1)	day)				
46																
47	Vanadium	Vanadium	38	10	2.1	8.0E-05	0.6	8	0.36	1.9E-06	0	0.007	0.0E+00	2.8E-04	0	1E-02
48	2,4-DNT	2,4-DNT	8.9	10	2.1	1.9E-05	0.6	8	0.36	4.6E-07	0.68	0.05	4.4E-09	9.1E-06	2E-07	4E-04

	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
49	HMX	HMX	11.5	10	2.1	2.4E-05	0.6	8	0.36	5.9E-07	0	0.5	0.0E+00	1.2E-06	0	6E-05
50	RDX	RDX	560	10	2.1	1.2E-03	0.6	8	0.36	2.9E-05	0.11	0.003	4.5E-08	9.6E-03	2E-06	5E-01
51	1,3,5-TNB	1,3,5-TNB	87	10	2.1	1.8E-04	0.6	8	0.36	4.5E-06	0	0.0005	0.0E+00	8.9E-03	0	4E-01
52	2,4,6-TNT	2,4,6-TNT	8000	10	2.1	1.7E-02	0.6	8	0.36	4.1E-04	0.03	0.005	1.8E-07	8.2E-02	9E-06	4E+00
53												TOTAL:	2E-07	1E-01		
54																
55													TOTAL CANCER RISK			1E-05
56													TOTAL HAZARD INDEX			5E+00
57																

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1									Table Q4-16									
2									Calculated Risk Estimates For Future Resident Scenario - TNT Leaching Beds Soil, Average									
3																		
4	TNT LEACHING BEDS - FUTURE ADULT																	
5	WIND EROSION - UNLIMITED EROSION POTENTIAL																	
6																		
7			mean wind	thresh wind														
8		veg cover (V)	speed (u)	speed (u(t))	F(x)	PM10 EMS	Area											
9			(cm/s)	(cm/s)		(g/m2 hr)	(m2)											
10																		
11		0	194	40	1 91	7 8	446											
12																		
13																		
14	Chemical	Concentration	Cont Emis	Sigma Y	Sigma Z	Wind Speed	Contam Conc	Hrs/day	Days/Yr	Wind	Inhal Rate	Expos Dose	SF	RfD	Cancer	Hazard		
15		(ug/g)	(ug/hr)	(meters)	(meters)	(m/s)	(mg/m3)			Fraction	(m3/hr)	(mg/kg/day)	(mg/kg/day 1)	(mg/kg/day	Risk	Index		
16																		
17	Vanadium	3 3	1 2E+05	12 5	7 5	1 94	5 6E 05	8	338	0 4	0 6	1 4E 06	0	0 007	0 0E+00	2 0E 04		
18	2,4 DNT	4 7	1 8E+04	12 5	7 5	1 94	8 0E 06	8	338	0 4	0 6	2 0E 07	0 68	0 001	5 9E 08	2 0E 04		
19	HMX	6 7	2 3E+04	12 5	7 5	1 94	1 1E 05	8	338	0 4	0 6	2 9E 07	0	0 05	0 0E+00	5 8E 06		
20	RDX	260	9 1E+05	12 5	7 5	1 94	4 4E 04	8	338	0 4	0 6	1 1E 05	0 11	0 003	5 3E 07	3 7E 03		
21	1,3,5 TNB	56	2 0E+05	12 5	7 5	1 94	9 5E 05	8	338	0 4	0 6	2 4E 06	0	0 00005	0 0E+00	4 8E 02		
22	2,4,6 TNT	5200	1 8E+07	12 5	7 5	1 94	8 8E 03	8	338	0 4	0 6	2 2E 04	0 03	0 0005	2 9E 06	4 5E 01		
23																		
24														TOTAL	3E-06	5E-01		
25	SOIL INGESTION																	
26										Total	Total							
27	Chemical	Concentration	Soil Ing Rate	Expos Freq	Exposure Dose	SF	RfD	Cancer Risk	Haz Index	Cancer Risk	Haz Index							
28		(ug/g)	(g/day)	(dy/yr)	(mg/kg/day)	(mg/kg/day 1)	(mg/kg/day)											
29																		
30	Vanadium	3 3	0 1	365	4 7E-05	0	0 007	0 0E+00	6 7E-03	0E+00	7E-03							
31	2,4 DNT	4 7	0 1	365	6 7E 06	0 68	0 001	2 0E-06	6 7E-03	2E-06	7E-03							
32	HMX	6 7	0 1	365	9 6E-06	0	0 05	0 0E+00	1 9E-04	0E+00	2E-04							
33	RDX	260	0 1	365	3 7E-04	0 11	0 003	1 8E-05	1 2E-01	2E-06	1E-01							
34	1,3,5 TNB	56	0 1	365	8 0E-05	0	0 00005	0 0E+00	1 6E+00	0E+00	2E+00							
35	2,4,6-TNT	5200	0 1	365	7 4E-03	0 03	0 0005	9 6E-05	1 5E+01	1E-04	2E+01							
36																		
37							TOTAL:	1E-04	2E+01									
38											TOTAL CANCER RISK			1E 04				
39											TOTAL HAZARD INDEX			2E+01				
40																		
41	TNT LEACHING BEDS - FUTURE CHILD																	
42																		
43	Chemical	Concentration	Cont Emis	Sigma Y	Sigma Z	Wind Speed	Contam Conc	Hrs/day	Days/Yr	Wind	Inhal Rate	Inhal Rate	Expos Dose	Expos Dose	SF	RfD	Cancer	Hazard
44		(ug/g)	(ug/hr)	(meters)	(meters)	(m/s)	(mg/m3)			Fraction	(0 5)	(6-17)	(0 5)	(6 17)	mg/kg/day 1	(mg/kg/day)	Risk	Index
45											(m3/hr)	(m3/hr)	(mg/kg/day)	mg/kg/day)				
46	Vanadium	3 3	1 2E+05	12 5	7 5	1 94	5 6E-05	8	338	0 4	0 84	1 08	9 3E 06	4 0E 06	0	0 007	0 0E+00	8 2E-04
47	2,4 DNT	4 7	1 6E+04	12 5	7 5	1 94	8 0E-06	8	338	0 4	0 84	1 08	1 3E 06	5 7E 07	0 68	0 001	1 4E-07	8 2E 04
48	HMX	6 7	2 3E+04	12 5	7 5	1 94	1 1E-05	8	338	0 4	0 84	1 08	1 9E 06	8 1E 07	0	0 05	0 0E+00	2 3E 05
49	RDX	260	9 1E+05	12 5	7 5	1 94	4 4E-04	8	338	0 4	0 84	1 08	7 3E 05	3 1E 05	0 11	0 003	1 3E 06	1 5E 02
50	1,3,5 TNB	56	2 0E+05	12 5	7 5	1 94	9 5E 05	8	338	0 4	0 84	1 08	1 6E 05	6 8E 06	0	0 00005	0 0E+00	2 0E 01
51	2,4,6 TNT	5200	1 8E+07	12 5	7 5	1 94	8 8E 03	8	338	0 4	0 84	1 08	1 5E 03	6 3E 04	0 03	0 0005	7 0E 06	1 8E+00
52																		
53																TOTAL	8E-06	2E+00
54	SOIL INGESTION																	
55												Total	Total					
56	Chemical	Concentration	Soil Ing Rate	Soil Ing Rate	Expos Freq	Exposure Dose	Exposure Dose	SF	RfD	Cancer Risk	Haz Index	Cancer Risk	Haz Index					
57		(ug/g)	(0-5)	(6-17)	(dy/yr)	(0-5)	(6-17)	mg/kg/day	mg/kg/day)									
58			(g/day)	(g/day)		(mg/kg/day)	(mg/kg/day)											
59																		
60	Vanadium	3 3	0 2	0 1	365	4 4E 04	7 3E 05	0	0 007	0 0E+00	5 5E 05	0E+00	9E-04					
61	2 4 DNT	4 7	0 2	0 1	365	6 3E 05	1 0E 05	0 68	0 001	4 9E 06	1 5E 01	6E-06	1E-01					
62	HMX	6 7	0 2	0 1	365	8 9E 05	1 5E 05	0	0 05	0 0E+00	8 0E 05	0E+00	1E 04					
63	HMX	260	0 2	0 1	365	3 5F 03	5 8E 04	0 11	0 003	4 4F 05	7 1E 02	4E-05	9E-02					
64	1,3,5 TNB	56	0 2	0 1	365	7 5E 04	1 2E 04	0	5E 05	0 0E+00	6 7E 07	0E+00	2E 01					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
65	2,4,6-TNT	5200	0.2	0.1	365	6.0E-02	1.2E-02	0.03	0.0005	2.4E-04	3.0E-03	2E-04	2E+00					
66									TOTAL:	3E-04	2E-01							
67													TOTAL CANCER RISK			3E-04		
68													TOTAL HAZARD INDEX			2E+00		
69																		

Table Q4-17

Calculated Risk Estimates For Future Resident Scenario - TNT Leaching Beds Soil, RME

TNT LEACHING BEDS - FUTURE ADULT

WIND EROSION - UNLIMITED EROSION POTENTIAL

veg cover (V)	mean wind speed (u) (cm/s)	thresh wind speed (ut) (cm/s)	F(x)	PM10 EMS (g/m2 hr)	Area (m2)
0	184	40	1 81	7 8	446

Chemical	Concentration (ug/g)	Cont Emis (ug/hr)	Sigma Y (meters)	Sigma Z (meters)	Wind Speed (m/s)	Contam Conc (mg/m3)	Hrs/day	Days/Yr	Wind Fraction	Inhal Rate (m3/hr)	Expos Dose (mg/kg/day)	SF (mg/kg/day 1)	RfD mg/kg/day	Cancer Risk	Hazard Index
Vanadium	38	1 3E+05	12 5	7 5	1 84	6 5E 05	8	338	0 4	0 6	1 6E 06	0	0 007	0 0E+00	2 3E 04
2,4 DNT	8 8	3 1E+04	12 5	7 5	1 84	1 5E 05	8	338	0 4	0 6	3 8E 07	0 68	0 001	1 1E 07	3 8E 04
HMX	11 5	4 0E+04	12 5	7 5	1 84	2 0E 05	8	338	0 4	0 6	5 0E 07	0	0 05	0 0E+00	9 9E 06
RDX	560	2 0E+06	12 5	7 5	1 84	9 5E 04	8	338	0 4	0 6	2 4E 05	0 11	0 003	1 1E 06	8 1E 03
1,3,5 TNB	87	3 0E+05	12 5	7 5	1 84	1 5E 04	8	338	0 4	0 6	3 8E 06	0	0 00005	0 0E+00	7 5E 02
2,4,6-TNT	8000	2 8E+07	12 5	7 5	1 84	1 4E 02	8	338	0 4	0 6	3 5E 04	0 03	0 0005	4 4E 06	6 9E 01
													TOTAL:	6E 06	8E 01

SOIL INGESTION

Chemical	Concentration (ug/g)	Soil Ing Rate (g/day)	Expos Freq (dy/yr)	Exposure Dose (mg/kg/day)	SF (mg/kg/day 1)	RfD (mg/kg/day)	Cancer Risk	Haz Index	Total Cancer Risk	Total Haz Index
Vanadium	38	0 1	365	5 4E 05	0	0 007	0 0E+00	7 8E 03	0E+00	8E 03
2,4 DNT	8 8	0 1	365	1 3E 05	0 68	0 001	3 7E 06	1 3E 02	4E 06	1E 02
HMX	11 5	0 1	365	1 6E 05	0	0 05	0 0E+00	3 3E 04	0E+00	3E 04
RDX	560	0 1	365	8 0E 04	0 11	0 003	3 8E 05	2 7E 01	4E 05	3E 01
1,3,5 TNB	87	0 1	365	1 2E 04	0	0 00005	0 0E+00	2 5E+00	0E+00	3E+00
2,4,6-TNT	8000	0 1	365	1 1E 02	0 03	0 0005	1 5E 04	2 3E+01	2E 04	2E+01
						TOTAL	2E 04	3E+01		

TOTAL CANCER RISK 2E 04

TOTAL HAZARD INDEX 3E+01

TNT LEACHING BEDS - FUTURE CHILD

Chemical	Concentration (ug/g)	Cont Emis (ug/hr)	Sigma Y (meters)	Sigma Z (meters)	Wind Speed (m/s)	Contam Conc (mg/m3)	Hrs/day	Days/Yr	Wind Fraction	Inhal Rate (0 5) (m3/hr)	Inhal Rate (6 17) (m3/hr)	Expos Dose (0 5) (mg/kg/day)	Expos Dose (6 17) mg/kg/day	SF mg/kg/day 1	RfD (mg/kg/day)	Cancer Risk	Hazard Index
Vanadium	38	1 3E+05	12 5	7 5	1 84	6 5E 05	8	338	0 4	0 84	1 08	1 1E 05	4 6E 06	0	0 007	0 0E+00	9 5E 04
2,4 DNT	8 8	3 1E+04	12 5	7 5	1 84	1 5E 05	8	338	0 4	0 84	1 08	2 5E 06	1 1E 06	0 68	0 001	2 7E 07	1 6E 03
HMX	11 5	4 0E+04	12 5	7 5	1 84	2 0E 05	8	338	0 4	0 84	1 08	3 2E 06	1 4E 06	0	0 05	0 0E+00	4 0E 05
RDX	560	2 0E+06	12 5	7 5	1 84	9 5E 04	8	338	0 4	0 84	1 08	1 6E 04	6 8E 05	0 11	0 003	2 8E 06	3 3E 02
1,3,5 TNB	87	3 0E+05	12 5	7 5	1 84	1 5E 04	8	338	0 4	0 84	1 08	2 5E 05	1 1E 05	0	0 00005	0 0E+00	3 0E 01
2,4,6 TNT	8000	2 8E+07	12 5	7 5	1 84	1 4E 02	8	338	0 4	0 84	1 08	2 3E 03	9 7E 04	0 03	0 0005	1 1E 05	2 8E+00
															TOTAL	1E 05	3E+00

SOIL INGESTION

Chemical	Concentration (ug/g)	Soil Ing Rate (0-5) (g/day)	Soil Ing Rate (6-17) (g/day)	Expos Freq (dy/yr)	Exposure Dose (0-5) (mg/kg/day)	Exposure Dose (6 17) (mg/kg/day)	SF mg/kg/day	RfD mg/kg/day)	Cancer Risk	Haz Index	Total Cancer Risk	Total Haz Index
Vanadium	38	0 2	0 1	365	5 1E 04	8 4E 05	0	0 007	0 0E+00	6 4E 05	0E+00	1E 03
2 4 DNT	8 8	0 2	0 1	365	1 2E 04	2 0E 05	0 68	0 001	8 2E 06	1 5E 01	8E 06	1E 01
HMX	11 5	0 2	0 1	365	1 5E 04	2 6E 05	0	0 05	0 0E+00	1 4E 04	0E+00	2E 04
RDX	560	0 2	0 1	365	7 5E 03	1 2E 03	0 11	0 003	8 4E 05	7 2E 02	1E 04	1E 01
1,3,5 TNB	87	0 2	0 1	365	1 2E 03	1 9E 04	0	5E 05	0 0E+00	1 0E 06	0E+00	3E 01

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
65	2,4,6-TNT	8000	0.2	0.1	365	1.1E-01	1.8E-02	0.03	0.0005	3.7E-04	4.2E-03	4E-04	3E+00					
66																		
67									TOTAL	6E-04	2E-01							
68													TOTAL CANCER RISK			6E-04		
69													TOTAL HAZARD INDEX			3E+00		